THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. FEBRUARY 25, 1897. CHICAGO, ILL. NUMBER 8

BEST ANTI-FRICTION METAL
For All Machinery Bearings.
MAGNOLIA METAL CO.,
Owners and Sole Manufacturers,
74 Cortlandt St., New York.
CHICAGO: Traders' Building. LONDON: 49 Queen Victoria St., E. C.

MAGNOLIA METAL

Moore's Anti-Friction
DIFFERENTIAL
CHAIN HOIST.

Adjustable Automatic Brake.
Self sustaining at every point.
Highest Efficiency
A New Movement.
A Perpetual Compound Lever.
Powerful, Simple and Durable.
Light, Compact and Strong.

NINE SIZES.
Half Ton to Ten Tons Capacity.
ALSO
HAND POWER CRANES, WINCHES, &c.

Moore Manufacturing Co.,
MILWAUKEE, WIS.

FORSTER, WATERBURY & CO.,
636-638 THE ROOKERY, CHICAGO.
PIG IRON AND COKE.
Agents for
Iroquois, Peerless, Sterling Scotch, Northern and Southern Charcoal Iron.
MALLEABLE BESSEMER.

THE CHICAGO SCREW CO.
TRADE MARK
SCREWS
94-108 W. WASHINGTON ST. CHICAGO

DICKMAN & MACKENZIE,
CLEVELAND, 71 Atwater Bldg.
CHICAGO, 1224 Rookery Bldg.
Mining properties examined. Ores sampled at mines, furnaces and all lake ports.
General analyses of Ores, Slags, Metals, Fuel Foundry Materials and Products, etc.
CHEMISTS AND ENGINEERS.

"CAHALL" VERTICAL WATER TUBE BOILERS MANUFACTURED BY THE AULTMAN & TAYLOR MACHINERY CO. MANSFIELD — OHIO
"BABCOCK & WILCOX" HORIZONTAL

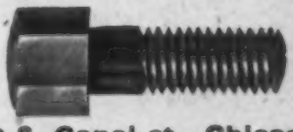
SEND FOR CATALOGUE.
CAHALL SALES DEPARTMENT,
Bank of Commerce Building,
PITTSBURG, PA.
145 Taylor Building, New York City, N. Y.
The "Rookery," Chicago, Ill.
71 Perin Building, Cincinnati, O.
10 Peninsular Bank Bldg., Detroit, Mich.
826 Cuyahoga Bldg., Cleveland, O
712 Union St., New Orleans, La.
842 Drexel Bldg., Philadelphia, Pa.
1016 Tremont Bldg, Boston.

ENTERPRISE BOILER COMPANY
YOUNGSTOWN, O.
Draught Stacks, Blast Furnaces and Heavy Plate Work a Specialty.
Write for Estimates.

BUFFALO VENTILATING FANS
ELECTRIC, STEAM AND PULLEY TYPES. GREATEST AIR VOLUME, LEAST POWER
BUFFALO FORGE CO. BUFFALO, N.Y. U.S.A.

CASTINGS FROM 1 OZ. TO 60,000 Lbs.
For Rolling Mills, Blast Furnaces, Etc.
GET OUR PRICES.
THE RIPPEL MANUFACTURING CO.
FOUNDRY AND MACHINE WORKS, MT. GILEAD, O.

ILLINOIS SCREW CO.,



40 S. Canal st., Chicago.

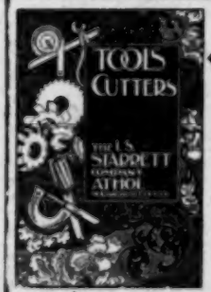
POWER TRANSMISSION
W. A. JONES FOUNDRY & MACHINE CO.
53-59 So. JEFFERSON ST. CHICAGO

WORKS, SHAKUN. MINES, CLEARFIELD CO., PA.
James V. Rose,
. . . PROPRIETOR . . .
SHARON FIRE BRICK WORKS,
Contractor in Fire Brick Construction.
Manufacturer of High Grade Fire Brick.

ANALYSIS:

Brick.		Rock Clay.	
SILICA,	54.50.	SILICA,	47.00.
ALUMINA,	44.30.	ALUMINA,	39.00.
LOSS ON IGN,	.65.	LOSS ON IGN,	13.80
IRON,	.15.	IRON,	.12.

SHARON, . . . PA



SHALL WE SEND YOU ONE?

We want every mechanic and manufacturer to have a copy of our 98 page illustrated catalogue of up-to-date tools and cutters. It is free.

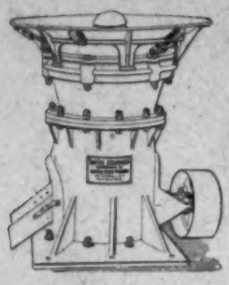
THE L. S. STARRETT CO., Box 67,
Athol, Mass., U. S. A.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

THE UPSON NUT CO., Cleveland, O..
. . . MANUFACTURERS OF . . .
MACHINE AND CARRIAGE BOLTS, HOT FORGED AND COLD PUNCHED NUTS, LAG SCREWS BOLT ENDS, WASHERS, ETC. Catalogue and Prices on Application.

IT PAYS to obtain prices of **WM. B. POLLOCK & CO.** Youngstown, Ohio. Blast Furnaces, Steel Plants, Boilers, Tanks, etc.



CRUSH ORES...

Prepare your ore for market so it will command the highest possible prices. All furnaces want crushed ores.

GATES BREAKER

Is the greatest on earth.

Over 4,000 of them in use.

GATES IRON WORKS, Dept. XX, 650 Elston Ave., CHICAGO.

IT PAYS TO ADVERTISE IN

THE IRON TRADE REVIEW.

STILWELL'S

PATENT LIME-EXTRACTING

HEATER AND FILTER

COMBINED.

Is the only lime-extracting Heater that will prevent Scale in Steam Boilers, removing all impurities from the water before it enters the boiler.

Thoroughly Tested.

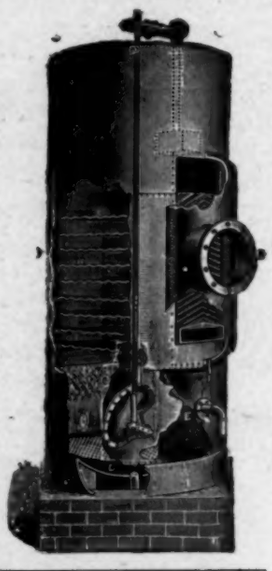
OVER 8,000 OF THEM IN DAILY USE.

ILLUSTRATED CATALOGUE.

Stilwell-Bierce & Smith-Vaile Company,

DAYTON, OHIO.

CHICAGO OFFICE, 63 S. Canal St.



JUNCTION IRON & STEEL CO.

WHEELING, W. VA., and MINGO JUNCTION, O.

MANUFACTURERS OF

Bessemer Pig Iron, Soft Bessemer Steel Blooms and Billets, Soft Steel Bars, scaled and sheared to lengths and weights, for Sheet and Tin Plate Manufacturers, also Soft Bessemer Merchant Bars

SUITABLE FOR

Agricultural Implement Makers, Wagon and Carriage Manufacturers, Car Builders and Locomotive and Railway Repair Shops.

Sales Offices: Room 14, Mason Bldg. Boston, Mass. 81 Fulton St., New York, N. Y. 519 Fidelity Bldg., Philadelphia Pa. 421 Wood St., Pittsburg, Pa. 10 Wiggins Blk., Cincinnati, O. 638 The Rookery, Chicago, Ill. Security Bldg. St. Louis, Mo.

Rooms 811 and 812 Perry-Payne Bldg., Cleveland, Ohio.

AIR COMPRESSORS

Thoroughly up-to-date and the most simple, durable and economical machines on the market. Built on improved lines.

ROCK DRILLS, AIR-LIFT, PUMPS, ETC.

Send for catalogue

RAND DRILL CO.

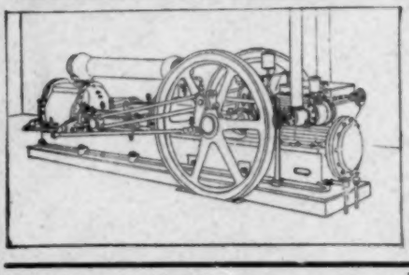
100 Broadway, New York.
1328 Monadnock Block, Chicago.

AIR COMPRESSORS

AND PNEUMATIC APPLIANCES.

CLAYTON AIR COMPRESSOR WORKS

SEND FOR CATALOGUE. 26 Cortlandt St. NEW YORK.



We will send to Engineers and Business men, our circular No. 15, upon Air and Gas Compressors for all purposes and for any desired pressure and volume.

THE NORWALK IRON WORKS CO.

301 Water St., SO. NORWALK, CT.

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stamps Seals, Stencils, Automatic Check Punches and Numbering Machines 92 Seneca St

O. TEXTOR,

Chemist and Metallurgist

Analyses made of Metals Ores. Fuels and Supplies for Furnaces, Steel Works and Foundries

Ores sampled at mines, furnaces and lake ports

Advice furnished to operators of Blast Furnaces Steel Works and Foundries.

Mining properties reported upon.

For 12 Years Chief Chemist to the Cleveland Rolling Mill Co.

158 Superior St., CLEVELAND, O.

Robert W. Hunt & Co.

1137 The Rookery,

CHICAGO.

Analyses of Iron Ores.
Sampling of ores.
Analyses of all ores, oils, waters, metals, etc.
Inspection and consultation.

F. A. EMMERTON,

Analytical Chemist

AND METALLURGIST.

Ores sampled at lake ports, mines and furnaces.
Mines and Metallurgical Processes examined.
Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.

9 Bratenahl Building, CLEVELAND, O.

Pickands, Brown & Co.

PIG IRON, IRON ORE

...AND...

FRICK COKE.

929-939 ROOKERY BUILDING, CHICAGO.

Prouty Electro-Gasoline Engine.

Has no equal for Shops, Factories, Dynamos, Hoisting, Pumping, Mills, Boats, Printing Offices, Tractions, Road Wagons.

Built in sizes from 2 to 50 Horse Power.

THE PROUTY CO., 334 Dearborn St., Chicago, Ill.

BLOW YOUR CUPOLA

---- WITH A ----

"STURTEVANT BLOWER."

SEND FOR CATALOGUES.

B. F. STURTEVANT CO.

Boston. New York. Philadelphia. Chicago. London, Eng.

C. K. PITTMAN,

SHIPPER OF

Coal & Coke

Best Grades of Coke a Specialty.

975 Old Colony Building, Chicago.

THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. FEBRUARY 25, 1897. CHICAGO, ILL. NUMBER 8.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Every portion of the iron trade has been touched by the wave of expectation started by the railroads two weeks ago. Bessemer pig iron and steel billets, the two products naturally first to be affected, have shown new activity since the sales of rails, but thus far no other marked results are observed, so far as buying is concerned. As actual track-replacing operations begin, contracts for splice-bars, track bolts and other requisites will increase; already there is a beginning in this direction. Inquiry for rails has not ceased, however, notwithstanding the well-booked condition of leading mills, and there are not lacking predictions that the year's business, with the good promise of exports that already appears, will come well up to the 2,000,000-ton mark. It is the probability of a consumption of nearly 2,000,000 tons of Lake Superior ores alone, in excess of the average amount that has gone into rails in the past four years, that is giving hope to the great basal industry. A few weeks ago iron ore had little outlook either for tonnage or price, in 1897; to-day the chances for tonnage, at least, are far from disheartening. One of the first fruits of the breaking of the rail agreement, the reductions in wages at various mills, has an unfavorable look on the surface. But the fact that the buying capacity of the workmen affected will be greater this year than in any year since 1892, because of their steady employment, is the thing to emphasize. There is agreement in the belief that values will range low in all iron and steel lines in 1897, but buyers are waiting for the ore interest to give some definite sign as to what the absolute low is to be. The vast amount of cheap-iron talk set loose in the past two months is sifting down to a more definite basis every week. Iron mining, railroad, vessel, dock, blast furnace and steel companies must still get a profit, if there is to be any healthy or permanent basis. Some of the going calculations sacrifice practical economics for sensation. The developments of the past week point to an expanding market for Bessemer pig and steel billets. In plain and barb wire and in wire nails, demand has been increasing, and in nails there has been $1 a ton advance, to $1.35, Pittsburg and Cleveland, while wire mills quote $1.10 on plain wire for early deliveries only. Inquiry for rods is greater and $20.50 Pittsburg and $21 Cleveland are quoted. The Pittsburg market for Bessemer pig and billets has been closely followed by buyers and sellers in the past week. Sales of the former at $10.15 and later at $10.25 have been made, and furnacemen have moved their quotations from 10 to 25 cents above the latter figure. The purchase of billets by the Carnegie Steel Co. has excited considerable interest, especially since it gives some hint of the extent to which the company's mills are to be employed on rails. Billets are quoted $15.25 to $15.75, Pittsburg, and the latter figure is held as minimum by mills; steel in middle hands has been offered at $15.25 to $15.50. Among the recent rail sales from the Pittsburg district, 60,000 tons for the Canadian Pacific are said to be included.

THE CLEVELAND DISTRICT.

A meeting of the Bessemer Ore Association was held in Cleveland on Tuesday. Apart from the Oliver and Mountain Iron mines, which have not been considered at any time in connection with an agreement for 1897, there was a general representation of Lake Superior Bessemer properties. A long and thorough discussion of the problems involved ended in adjournment to Monday, March 1. The meeting confirmed the statement previously made in this column that whether Mesabi mines are or are not included, the probabilities favor an agreement as to tonnage and price among the Bessemer ore producers on other ranges. The disposition is general, moreover, to make prices for 1897 conform to the new conditions. It is likely that the differential between Mesabi Bessemers and those of other ranges will be smaller than heretofore. This approximation of prices would have a direct relation to the percentage of Mesabi ores used by furnaces having no interest in that range. If the Mesabi mines enter the market for next season, with no restriction as to output or price, the year's operations would give a better demonstration than has yet been had, of the standing of these ores with furnacemen. With the furnace interest there is found to be a sentiment in favor of an ore agreement at prices in harmony with the new basis for pig iron and steel. A stable price the season through would be guaranteed and the furnaces could make up their mixtures for a year with the assurance that no advantage would come to those who might hold off for a fall. Naturally a leading consideration in connection with any proposal to include Mesabi mines, outside of the Carnegie-Oliver properties, is the rivalry of the two railroads on the Mesabi range. The large tonnage that the Carnegie mines will bring to the one, in addition to what the Rockefeller and independent mines would furnish, tends to enlarge the demands of the Minnesota interest for its mines. The Norrie's situation is another problem, but the indications are that this will be satisfactorily solved. The fact that the Consolidated mines are represented in the conferences and that that interest is favorable to an agreement disposes of the talk that Rockefeller would work the ore pool's undoing. The Mesabi situation may not work out, but nevertheless an agreement on a basis approximating 1895 prices for old-range ores is quite probable.

Pig Iron. The sale of 10,000 tons of Bessemer pig iron at $10.25 in the valley, deliveries over the next six months, reported last week, was followed

Continued on page 6

CHICAGO.

OFFICE OF *The Iron Trade Review*, 1142 MONADNOCK BLOCK, Feb. 24.

After the unusual events and excited condition of the market in the previous two weeks last week was quiet. No new developments are reported in steel rail matters; some additional sales have been made but none but small ones were made from this market. General business has been a little better than it was previous to the collapse of the rail pool but not sufficiently so to make a decided improvement. It is likely that the beneficial results of the large sales of rails will be felt to a greater extent after the rail mills have been in operation for some time. The structural market last week was a little better than the week before and two or three large contracts have come up to be figured upon. There are several in the market now and as they will be placed soon the next week or ten days will show a considerable improvement in the tonnage closed. Other classes of steel are quiet and sales have been limited to small lots in almost every case.

PIG IRON.—The recent large sales of rails will undoubtedly have an effect upon the foundry pig iron market but it is not expected that this effect will be felt for the next two or three weeks. The large tonnage of Bessemer iron required by the rail mills will reduce the number of furnaces which are manufacturers of foundry iron and this naturally makes the foundry iron producers firmer in their views. This is particularly true of Northern furnaces but Southern furnaces will undoubtedly feel the effects, sympathetically at least. Sales last week were only small. The inquiry is a trifle better but hardly sufficiently so to denote any immediate improvement in sales. There is no change in prices, both Northern and Southern furnaces holding to the quotations as given:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 1 Soft	$10 90@11 40
Local Coke Fdy. No. 1	11 50@12 00	Southern No. 2 Soft	10 65@10 90
Local Coke Fdy. No. 2	11 00@11 50	South'n Silveries	11 40@11 65
Local Coke Fdy. No. 3	10 75@11 00	Jackson Co. Silveries	14 00@16 00
Local Scotch Fdy. No. 1	11 50@12 00	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	11 00@11 50	Ohio Silveries No 2	14 50@15 00
Local Scotch Fdy. No. 3	10 75@11 00	Ohio Strong Softeners	14 00@14 25
South'n Coke No. 1	11 15@11 40	Alabama Car Wheel	16 00@16 50
South'n Coke No. 2	10 65@11 15	Malleable Bessemer	12 00@12 25
South'n Coke No. 3	10 40@10 65	Coke Bessemer	13 00@13 50

BAR IRON.—Several round lots of bars were sold last week and the inquiry appears to keep up very well. Steel bars are getting a largely increased proportion of the business going because of the lower prices being made on steel. Some of the mills making steel bars only are inclined to restrict their sales at the low prices ruling. Prices are made as follows: Common iron, 1.25c to 1.30c; soft steel bars from strictly billet stock, 1.15c to 1.25c.

RAILS AND TRACK SUPPLIES.—Nothing new is reported in the rail market. There continue to be inquiries received for small lots, but no large orders were closed in this market last week. It is reported that the Union Pacific has placed an order for 30,000 tons with the Carnegie Steel Co. through the Pittsburg office. The Illinois Steel Co. is asking from $21 to $24 for steel rails, according to specifications, and has refused to consider offers at less than these prices. Quotations are made as follows: Rails, $21 to $24, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.95c to 2c; hexagon nuts, 2.05c to 2.10c; spikes, 1.65c to 1.75c.

BILLETS AND RODS.—The market has been quiet and no large sales have been made. There is no indication that an increase in the demand will be had in the immediate future. Quotations are made at $17.50 to $18 for billets, and $24 to $24.50 for rods.

STRUCTURAL MATERIAL.—Bids are being made this week on a court house at Ft. Wayne requiring about 1,400 tons of material. The Rock Island road has asked for bids on several thousand tons of bridge material required in track elevation in continuation of the work done last summer. General business is a trifle better than it was last week, and orders on old contracts are coming forward satisfactorily. Quotations are as follows: Beams and channels, 1.75c to 1.80c; angles, 1.25c to 1.30c; plates, 1.25c to 1.30c; tees, 1.50c to 1.55c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Some of the mills report a much better business in the last week while others say that the market is not materially improved. One or two fairly good sized contracts were closed last week but most of the business is in small lots. Prices are made as follows: Tank steel, 1.25c to 1.30c; flange steel, 1.35c to 1.45c; fire-box, 2c to 5c.

SHEETS.—Both black and galvanized sheets have been quiet and very few sales of any considerable tonnage have been closed. Most of the business taken has been in small lots. Quotations are made at 2.15c to 2.20c for No. 27 black and 80 to 80 and 5 per cent discount for galvanized.

MERCHANT STEEL.—Business closed last week was only fair and did not include any very large contracts. The outlook is somewhat better than it was a week ago, as inquiries are more numerous. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.55c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD MATERIAL.—A sale of 1,000 tons of old iron rails is reported at $12. Another sale of 1,000 tons at $12.50 was closed, but as the buyer did not furnish shipping directions within the required time it was canceled by the seller. Other business was light and the indications do not point to an immediate increase. As a rule buyers and sellers are very wide apart in their views. Prices are made at $12 and $12.50 for old iron rails; $8.50 to $9 for old steel rails, and $10 to $10.50 for old wheels. Miscellaneous scrap is quoted about as follows: Railroad forge, $11.50. to $12; dealer's forge, $10 to $10.50; No. 1 mill, $7 to $7.50; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8.50; axles, $13; cast borings, $3; wrought turnings, $4; axle turnings, $5.50 to $6; mixed steel, heavy, $7.50; stove plates, $5.50; heavy melting steel, $9.00 to $9.25.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 807 TRADESMEN'S BUILDING, Feb. 24.

The surprise of the week is the reported purchase by the leading local producer of a considerable tonnage of billets. The move, to the trade generally, seems significant, and the changing of the Duquesne plant to rails would only confirm expectations. Billets continue strong and only attractive business is noticed by the well booked local mills. Bessemer maintains advanced ground and the refused quotations of the last few weeks are the ruling figures in current transactions. Aside from additional purchases by the local non-producer who covered for a large tonnage last week, the sales of Bessemer are inconsiderable. Inquiries for upwards of 20,000 tons appearing since Monday improve the situation. Finished lines continue stagnant. In wrought pipe alone is there improved business noted. Inquiries, however, for all lines are on the increase.

BILLETS AND RODS.—The purchase of some 25,000 tons of billets by the leading local interest has been the event of the week. In the absence of any information, the inference generally made is that the Duquesne plant will shortly be put on rails. Rumors of more foreign sales by Pittsburg lend color to the opinion. The 25,000-ton purchase of billets is said to consist of two lots of 10,000 and 15,000 respectively. The first, according to report, was the product of a Shenango valley steel plant and was for delivery at Beaver Falls. The latter lot, secured from a Pittsburg mill, goes, it is said, to a Braddock plant. The price is said to average on the two lots in the vicinity of $15.50. The market is the gainer by the transactions and $15.75 is named as a minimum by local mills. It is not unlikely that a limited tonnage could be had at $15.50. So well are local and neighboring interests booked that only unusually attractive propositions are entertained.

PIG IRON.—Although bullish sentiment in iron has been common for some time past, the first decisive advance has come in the week under review. Furnacemen who have been asking $10.15 and $10.25 valley for Bessemer have advanced their quotations to $10.35 to $10.50 and sales have been made at $10.10 to $10.25. Following the sale of 25,000 tons mentioned last week additional purchases by the same interest are reported aggregating 15,000 tons at prices ranging slightly above $10. Local conditions have been materially stiffened by the rumor that a Northern Ohio interest and a valley steel works—both heavy buyers—have been feeling the pulse of the market. In addition inquiries aggregating 20,000 have appeared so far this week. So far as is now known none of these requirements have been covered. Bessemer is accordingly stiffer and may be quoted at $10.80 to $10.90, offered. A sale of No. 2 foundry is reported at $10.50 and sales as low as $10.25 are rumored, but these figures are below

the general quotation. Gray forge has been inactive for some time and is quoted at $9.50. Pittsburg quotations follow:

Bessemer	$10.80 to $10.90
No. 1 Foundry	11.25 to 11.50
No. 2 Foundry	10.50 to 10.75
No. 3 Foundry	10 00 to 10.25
Gray Forge	9.50

RAILS AND TRACK SUPPLIES.—Business in rails has subsided because of the inability of the local interest to care for orders. Prices are therefore of little significance and the $20 spoken of is only nominal. The improvement in track supplies is gradual and no change in ruling rates is announced. We quote: Rails, $20; splice bars, 1.40c to 1.45c; track bolts, iron, 1.95c to 2c; steel spikes, 1.65c to 1.75c.

STRUCTURAL MATERIAL.—Projects of various dimensions are beginning to appear, calling for estimates to an extent that indicates material progress ahead. Among the probabilities at present are the court house at Ft. Wayne, Ind., the projected grain elevator in Buffalo and a Buffalo hotel, which will involve some 1,500 tons of material. Business in hand is meager. Prices are continued: Beams and channels, 15-inch and under, 1.55c; 20-inch, 1.70c 24-inch, 1.75c; angles, 1.10c to 1.15c; tees, 1.35c to 1.40c; zees, 1.30c to 1.35c; universal plates, 1.10c to 1.15c.

BARS.—Bar iron at 1.10, Youngstown, is an open market. Pittsburg brands of refined iron range higher but find no buyers. Steel bars continue to get the bulk of the business and are obtainable below 1c. The leading interests maintain advanced prices on current small-lot business and are securing business on a basis of 1c to 1.05c. Muck bar holds at $19 to $19.50.

PLATES.—A contracted but steady volume of business continues with Pittsburg mills. Running contracts in the main comprise the business. Quotations continue: Tank, 1.15c to 1.20c; shell, 1.25c to 1.30c; flange, 1.35c to 1.40c.

WROUGHT PIPE.—A better outlook is generally noted in merchant pipe. Sales of the week are in advance of former weeks and the increased inquiry on merchant pipe is marked. Line pipe demands are small. Prices continue unprofitable, being quoted as follows: Merchant pipe, 57 to 67 per cent, and for galvanized, 50 to 55 per cent; six tens on car load lots and five tens and 5 per cent on smaller lots. On merchant boiler tubes we quote: Two and a quarter inches and smaller, 70 and 10 per cent discount; two and a half inches and over, 75 and 5 per cent discount; casing, inserted joints, 57½ per cent discount; screw and socket joint, 62½ per cent discount.

SHEETS.—An occasional spurt is noticed in the demand for sheets, and a few contracts have been made covering three months. Black sheets are quoted: No. 26, 1.90c to 1.95c; No. 27, 2c to 2.05c; No. 28, 2.10c to 2.15c; galvanized at 80 to 80 and 5 per cent off list.

MERCHANT STEEL. — No evidence of the better demand felt elsewhere can be noted here. We continue to quote: Machinery steel, 1.30c to 1.35c, base; sleigh shoe, 1.30c to 1.35c; soft steel bars, 1.20c; machine straightened, tire, 1.30c to 1.40c; spring, 1.30c to 1.35c; open-hearth spring, 1.55c to 1.60c; toe calk, 1.45c to 1.55c; tool steel, common, 5c to 7c. Special brands, 10c and upwards.

IRON AND STEEL SKELP.—We quote: Grooved steel skelp, 1c to 1½c; sheared, 1.07½c to 1.10c; grooved iron skelp, 1.15c to 1.17½c; sheared, 1.30c to 1.35c.

OLD MATERIAL.—A sale of short ends of steel rails is reported from the valley at $10.50. Local dealers are asking $11.50 without takers. Wrought scrap is reported low but no sales are located. General business continues inactive and price is a matter of opinion: Wrought scrap, $11; cast scrap, $10 to $10.25; car wheels, $11.50, gross; old steel rails, $13 to $13.25; coil spring, $10.75 to $11, gross; hammered iron axles, $16 to $16.50, net; rolled iron axles, $14 to $14.50; heavy melting stock, $12.50 to $13; machinery cast, $9.75 to $10.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Buffalo. Although the iron business is far from satisfactory to either producer or consumer in this district, there has been noticed during the past week a greater demand for immediate shipment for actual consumption. Besides this, inquiries are more frequent and for larger amounts. Many believe a gradual improvement can be looked for from now on. Some of the malleable works have recently taken large sized contracts for railroad work. However, prices still remain weak and a good sized inquiry for immediate shipment would probably be accepted on a slightly lower basis than mentioned below. We quote: on a cash basis, f.o.b. cars, Buffalo: No. 1, foundry, $12; No. 2, $11.50; Ohio strong softener, No. 1, $12.25; No. 2, $11.75; Jackson Co. silvery, No. 1, $14.25; Southern soft, No. 1, $12; No. 2, $11.50; Lake Superior charcoal, $14.

Philadelphia. The rail business done by Pennsylvania mills east of Pittsburg is put at 250,000 tons and upward; but the export orders taken at Pittsburg have excited more comment than all the business for railroads at home. The exportation of American billets and sheet and tin plate bars is another development that is much commented on; and the opinion is general that this business is not ephemeral, but will rather increase in the coming year. The local demand for finished material has not felt the stimulus of the rail movement. Plates seem to be most active. There is close competition between two Eastern mills and prices on some shipyard orders just let were remarkably low. Bars are somewhat more active, with a slightly firmer quotation on steel, in view of the improvement in billets. We quote: Beams and channels to 15 inches, 1.75c; plates, 1.25c to 1.30c; angles, 1.20c to 1.25c; refined bars, 1.15c to 1.20c; steel bars, 1.15c to 1.20c. There is somewhat more disposition to buy billets, and we quote $17.75 to $18, on deliveries to June. The pig iron market is stronger in tone, but prices are as low as in any week of the year. Sales are of increasing volume, and some producers show a disposition to put limitations on deliveries. With production stationary and consumption on the gain, the indications are that the market will work to better ground. Foundrymen are more hopeful, but do not find any tangible evidence of better things as yet. They share the general belief, however, that the large amount of railroad work that will be done means a quickened demand in other lines.

Cincinnati. The extraordinary sales of steel rails, now reported to have been as much as 1,000,000 tons, have resulted in a quickening of the general steel and iron market and imparted a large measure of hope and expectancy in the direction of improved condition of manufacturing and commerce. The continued enlargement of exports of pig iron, steel rails, machinery, hardware, etc., in addition to liberal shipments of cereals, keeping the trade balance handsomely in our favor, contributes further to strengthen the hopes of an early general revival. During the week just closing, inquiries and sales have been somewhat more numerous, though prices have been irregular. Bessemer pig has stiffened, but non-Bessemers, because of surplus and liberal production are as yet not participating in any advance. The quotations at Birmingham have been $7.75 for No. 1 foundry, $7.25 for No. 1 soft and $7 for No. 2 foundry, but it is found that where Northern buyers are ready to contract there is a considerable shading of these prices, the furnaces taking each transaction by itself and coming to some satisfactory price. We quote the Cincinnati market as follows: Southern coke, No. 1 foundry, $10.25 to $10.50; No. 2, $9.75 to $10; No. 3, $9.25 to $9.50; gray forge, $9 to $9.25; mottled, $8.75 to $9; No. 1 soft, $9.75 to $10; No. 2, $9.75 to $10; Hanging Rock charcoal, No. 1, $15 to $16; Tennessee charcoal, No. 1, $13 to $14, Jackson Co. silvery, No. 1, $13 to $14; Standard Alabama car wheel, $14.75 to $15.50; Tennessee car wheel, $13.50 to $14.50; Lake Superior car wheel and malleable, $14.75 to $15.25. The market for old material is quiet, with quotations nominally unchanged. We quote selling prices, f.o.b. Cincinnati: No. 1 railroad wrought scrap, $10.50, net ton; cast scrap, $7.50, gross ton; steel rails, $8.50, gross ton; iron rails, $11.50, gross ton; car wheels, $9.50, gross ton.

THE serious break in steel rail prices has already resulted in a reduction in wages at most of the mills represented in the late association, and a reduction will doubtless follow at all of them. This is not the sort of "prosperity" that we all hoped and worked for only a few months ago. The railroads get their rails almost as a free gift, the manufacturers lose money, and the men who make the rails have their wages cut down. But the Free Traders are happy!—[Bulletin.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET:
G. H GARDNER President. A. I. FINDLEY, Editor.

CHICAGO:
1142 MONADNOCK BLOCK.
B. M. GARDNER, Associate Editor and Western Manager.

PITTSBURG:
807 TRADESMEN'S BUILDING.
JAMES R. MILLS, JR., Manager.

Subscription (strictly in advance), $3 per annum. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

FEBRUARY 25, 1897.

THE CLEVELAND DISTRICT.—Continued from Page 3.

by several sales at $10.10, $10.15 and at $10 for nearer deliveries. To-day's market, however, seems firm at $10.25 valley furnace, and 3,000 tons and 5,000 tons are reported sold on that basis. Considerable iron has been taken in the past two weeks by a middle interest, and in one or two cases conversion deals are reported which have been made the basis of reports as to Bessemer iron prices that in turn required the attendant steel prices to give them any significance. Furnacemen are strengthened in their position by the heavy prospective consumption of Bessemer iron, and by the further fact that any probable reduction in ore prices has been fully discounted by the transactions of the past two months. Two Ohio steel plants are said to be feeling the market. Foundry iron in this district has not yet started, and prices are as low as at any time in recent weeks. Outside districts report some inquiry for charcoal iron for malleable purposes, but the tonnage closed is light. Forge iron is sold at $8.60 to $8.75 in the valley. We quote Cleveland prices:

Bessemer	$ ... $10 90	Valley Scotch No. 1	$10 90@11 15
No. 1 Strong Foundry	10 90@11 15	Valley Scotch No. 2	10 60@10 75
No. 2 Strong Foundry	10 15@10 40	Gray Forge	9 50@ 9 75
No. 3 Foundry	9 90	Lake Superior Charcoal	13 50

Finished Material.

Wire and wire nail mills report growing activity, and in nails the stocking-up movement, after the late period of restriction, seems to be fully under way. Sales of wire at $1.10 are for immediate delivery and makers ask $1 a ton more for March and later business. In wire nails the tonnage of current business is large and the Cleveland price has been advanced from $1.30 to $1.35 in the past week, but there will be no advance that will start the idle nail machines. The Cleveland Rolling Mill Co. is now putting wire nails on the market in sizes from 3d. to 60d. Some inquiry for rods is noted and $21 is the quotation. Offers of steel billets by middlemen at $15.75 are reported. The heavier steel products have shown little activity in the week. The recent Big Four purchase of 15,000 tons of rails was followed this week with a contract for 1,100 tons of splice-bars. Structural material is inactive. Bar iron is quoted 1.10c valley mill, but steel is still getting most of the meager business going. The old material market is still waiting. Prices have fallen off considerably since the January sales by local railroads, and buyers, both dealers and mills, are chary of trading. We quote old iron rails at $14 to $14.50, No. 1 railroad wrought scrap $10 and mill scrap at $8.

FLOOD DAMAGE IN THE PITTSBURG DISTRICT.

PITTSBURG, Feb. 24.—The rapid rise of the Monongahela River in the first two days of the present week brought its waters to a height even above, at some points in the Monongahela Valley, the record of the memorable flood of February, 1884. At a number of iron and steel plants great damage was done. At McKeesport the damage is reported to be the worst ever known, from the waters of both the Monongahela and the Youghiogheny. The National Tube Works were closed down entire and the company's loss was several thousand dollars. The Monongahela Furnaces were compelled to suspend on account of the water, though it did not reach the tuyeres. The mill of the W. Dewees Wood Co. was flooded and water entered the warerooms ruining a considerable stock of sheet iron. At Demmler, the United States Tin Plate Works were under water for a time and considerable damage to stock was sustained. The Sterling Steel works suffered loss to machinery. The Otto-Hoffman plant of by-product coke ovens, at Glassport, recently completed by the United Coke, Gas & Chemical Co., was compelled to suspend and great damage from the complete flooding of the retort ovens is likely to result. The plant was in operation and the loss from cracking owing to the sudden submerging of highly heated checker-work will be considerable. The new galvanizing works at Versailles were compelled to suspend.

The entire manufacturing district between Pittsburg and the Youghiogheny River was inundated. At the Monongahela Iron Works, below Homestead, iron in the puddle furnaces was chilled. The Homestead Steel Works are on high ground, but the pumps were stopped by the water. The Edgar Thomson works were shut down Tuesday afternoon and the flood compelled the taking off of the blast at all the Edgar Thomson blast furnaces. The Pittsburg Wire Works at Braddock had a foot of water. Duquesne Forge had five feet. Fires were quenched in the coke ovens of the Carrie Furnace Co. The idle stack of the Carrie Furnace Co. was reached, and had it been in blast serious trouble would have resulted. The water was within a few inches of flooding Furnace A also.

The water at Wilmerding has a wider valley, but the Westinghouse Air Brake Co.'s floors were covered a few inches. At East Pittsburg the water in Turtle Creek backed up and ran into the plants of the Westinghouse Electric & Mfg. Co. and the Westinghouse Machine Co., causing a suspension of operations.

The South Side iron and steel works in Pittsburg suffered severely and all the mills lining the river banks were closed. At the Oliver Bros. plant, between South Third and South Ninth streets, the stock on hand was transferred to cars. Some of the machinery was under water. The lower portion of the Jones & Laughlins mills was under water. At the Painter mill the pump-house was flooded. Clinton blast furnace had several inches of water, and the furnace was prepared for a temporary suspension. Sligo mill was almost all flooded, and at Singer, Nimick & Co.'s plant water filled the pits.

Reports of Wednesday indicate that the flood is receding.

Pittsburg Foundrymen's Association.

The Pittsburg Foundrymen's Association met in regular session Monday evening, Feb. 22, at the Builders' Exchange. President Robert Taylor occupied the chair. Secretary Zimmers' call of the association showed the following members in attendance: President Taylor and H. M. Wilson, Taylor-Wilson & Co.; Secretary, F. H. Zimmers, Union Foundry & Machine Co.; Treasurer, Joseph S. Seaman, Seaman-Sleeth Co.; Philip Mathes, Brittain, Graham & Mathes; Wm. Yagle, Wm. Yagle & Co.; T. E. Malone and J. S. McCormick, J. S.

McCormick Co.; A. F. Barker, Pittsburg Mfg. Co.; Eliot A. Kebler, Matthew Addy & Co.; James Altsman, Jas. Collard Co.; C. Nicholas and F. A. Baker, Seaman-Sleeth Co.; Wm. Young, Center Foundry Co., Wheeling; Jas. R. Mills, Jr., *The Iron Trade Review*.

The Robinson-Rea Mfg. Co. was elected to active membership and Sidney Pflaum, manager of the Fort Pitt Smelting & Refining Co., was elected to associate membership.

The order of the evening was an address by Secretary John A. Penton of the American Foundrymen's Association, on "Benefits and Difficulties of Foundrymen's Associations." In view of the limited attendance, it was decided to arrange for a popular meeting of all foundrymen in Pittsburg and contiguous territory one month hence and to postpone until that time the address of Mr. Penton. A banquet is proposed as an adjunct of the open meeting and other social features will add to the pleasure of the meeting. President Taylor appointed as a committee on arrangements for the open meeting: Mr. Zimmers, chairman; Messrs. Yagle, Evans, Seaman and Mills.

The Detroit meeting of the American Foundrymen's Association was considered and the advisability of a large delegation from Pittsburg was urged by Mr. Penton and several local members. No action was taken, but Pittsburg will doubtless be well represented at the annual meeting in May.

Important Decision Concerning Unmarked Warrant Iron

Judge Stevenson Burke and James Corrigan, of Cleveland, as members of the old firm of Corrigan, Ives & Co. have won an important suit in the Supreme Court of Wisconsin, the decision being given Feb. 23. In July, 1893, the Douglas Furnace Co., which operated blast furnaces at Sharpsville, Pa., owed Corrigan, Ives & Co., of Cleveland, dealers in iron and iron ore, $180,000 for iron ore furnished. On the 18th of July, 1893, Max Hirschfeld, president of the Douglas Furnace Co., in a conversation with Judge Burke and Mr. Corrigan, stated that his company had issued at the request of Ferdinand Schlesinger, its principal stockholder, large numbers of so-called storage warrants for pig iron. These storage warrants Schlesinger had used as collateral security in borrowing money at the Milwaukee banks. But the iron which appeared to be covered by these warrants had never, it was claimed, been set apart from the other iron in the yards of the Douglas Furnace Co., nor any means used to indicate that such an attempted pledge had been made of it. Action was at once brought by Corrigan, Ives & Co. on a judgment note it had received from the Douglas Furnace Co., and a levy was made on the iron in the furnace yard, to the value of $130,000. Suit was brought by the Commercial Bank of Milwaukee against Corrigan, Ives & Co., the plaintiff claiming the iron under the Schlesinger warrants which it held. The bank won in the lower court in Wisconsin, but this court is now reversed on the ground that the iron covered in the warrants was not set apart or designated in any way.

Concerning Variations in the Metalloids.

TO THE EDITOR:

I was pleased to note Mr. Guy R. Johnson's criticisms on my paper before the Pittsburg Foundrymen's Association, published in your issue of the 11th inst. The only point of difference I can discern between Mr. Johnson and myself, if we can call it a difference, is on the question of manganese. It is true that manganese may vary considerably in what can be called "white" and "gray" iron coming from the same ores, etc., but I am inclined to think Mr. Johnson has not caught the right idea of the paper, which did not mean to deal with the radical extremes in making iron. A furnace may run a whole year and not "get off" so as to produce "white iron," and if it did, the loss of the manganese would not be the chief cause of "white iron," but the low silicon or high sulphur. The point my paper made was that in the normal or average running of a furnace the metalloids silicon and sulphur are chiefly responsible for changes in the grade of iron coming from similar ores, fluxes and fuel. I have yet to be shown where the grade of an iron was changed by alterations in the percentage of manganese in making iron from the same ores, etc., in the general running of a furnace. As a rule, what variation may occur in manganese is insufficient to make any practical difference in the grade of an iron. I have watched a furnace for two years at a stretch and failed to find its iron vary 20 points in the manganese, whereas during that period the silicon would vary 1.50 and the sulphur .040, or fluctuate so as to make grades of iron varying from No. 1 to No. 3 from similar ores, fluxes and coke.

THOMAS D. WEST.

Personal.

John Pettigrew, for 25 years in charge of the Illinois Steel Co.'s foundry, now has a similar position at John Featherstone's Sons foundry, Chicago.

John G. A. Leishman, whose retirement from the presidency of the Carnegie Steel Co., Ltd., takes place April 1, is being influentially commended to the consideration of the President-elect McKinley for appointment as minister to Switzerland.

Christopher L. Graff, a well-known iron manufacturer of Pittsburg, died last week aged 74. At one time he was connected with Everson, Preston & Co., then of Soho, but later removed to Scottdale. At the time of his death he was connected with the Scottdale Iron & Steel Co., of Scottdale, Pa.

Patrick H. Lineen, manager of the Chicago office of the Holly, Mfg. Co., was accidentally killed in that city on February 15, while trying to save the lives of two strangers who he thought were in danger of being run over by an Illinois Central train.

F. W. Wood, president of the Maryland Steel Co., has sailed for Europe. Naturally, the possibility of further export business for the United States in steel rails is discussed in this connection.

Col. Jas. F. Botsford, of Youngstown, O., for a number of years an officer of the Mahoning Valley Iron Co., and active in its management until last year, has been named by President-elect McKinley for the position of Marshal of the District of Columbia. The salary is $12,000 a year. Col. Botsford was an army comrade of Maj. McKinley.

F. T. Gates, president of the Lake Superior Consolidated Iron Mines, has been in Cleveland the past week.

F. L. Grammar, formerly chemist at the Edgar Thomson Works, and lately with the Lackawanna Iron & Steel Co., has been appointed superintendent of the Duquesne Furnaces of the Carnegie Steel Co., Ltd., succeeding James Gayley, temporarily in charge.

THE Davis Coal & Coke Co. is the first to adopt electricity in connection with mining operations in the West Virginia and Maryland region. The company is a large miner and shipper of bituminous coal along the West Virginia Central & Pittsburg Railroad from Piedmont to Elkins, W. Va. At Thomas the company has two mines; at Coketon, two miles distant, are two other mines and 500 coke ovens. The electric station to furnish power to these mines has been located at Thomas. The power generated at the Thomas power-house is used for coal cutting and the operation of five elevators and conveyors. The coal cutting circuits run distances of a little over a half mile in two directions, in what is known as the drift mine. Seven machines have been installed in the mines.

AN entirely new departure in the building of grain elevators will be inaugurated by the Great Northern Railroad in the construction of one which will be built soon at Buffalo by that road. The entire building will be of steel, the bins being constructed of steel plates. They will be circular in shape, decreasing in size toward the bottom, and terminating in a chute, so that the grain can be handled without any shoveling in the bins. The elevator will have a capacity of 2,000,000 bushels, and will be built by D. A. Robinson, contractor, of Chicago. It will take at least 5,000 tons of steel shapes.

C. H. ISOM, civil engineer and surveyor, Oregon City, Ore., writes that he will be in the market in the coming spring for steam motors, and would like to correspond with manufacturers.

THE Pennsylvania Bolt & Nut Works has broken ground at Lebanon, Pa., for an addition. It will be 70 x 30 feet, and washers will be made in the building.

THE Reading (Pa.) Iron Co., which employs 1,800 hands, has posted notices of a reduction in wages.

A METHOD OF CASTING CHILLED ROLLS.

The cuts and description which follow are taken by permission of the Lewis Foundry & Machine Co., of Pittsburg, from a pamphlet it has just issued, entitled, "Something About Chilled Rolls:"

The depth of chill on a roll is a matter that is wholly governed by the mixture of the metals from which the rolls are made. There are chilling irons and non-chilling irons. There are irons that will not chill at all by themselves, but when not too great a proportion is used with chilling irons, the non-chilling irons will assimilate with them and produce chill. Then there are non-chilling irons that will not only not assimilate properly or readily with chilling irons, but will positively retard the chilling of irons which in themselves would readily chill. These latter must be avoided by the chilled roll maker. To make a roll with deep chill, chilling irons only should be used, and in larger proportions as compared with irons which do not chill readily. When excessive chill is not wanted, a less proportion of deep chilling irons will give the result. Usually the strongest irons will shrink the most, but, will not always chill well. If the iron used is excessive in shrinkage, then the roll may crack after it is cast and during cooling. The strongest chilling irons which have the least shrinkage, are the irons to be used in making chilled rolls. Charcoal irons, warm blast and cold blast, are the irons which the chilled roll maker must use, for these and these only, possess the requirements.

Irregularity, or lack of uniformity, in the depth of the chilled surface has long been the fruitful cause of loss to makers and users of chilled rolls. Probably no other cause has led to so many rolls being condemned or replaced by the makers; or so many rolls breaking while in service in the mills, entailing annoying delays and expense. This fault has been attributed to various causes by men of much intelligence and experience. They differ concerning it. Some have supposed that the lack of uniformity in the depth of chill was caused in some manner by the mixture employed; that is, that the non-chilling irons and the chilling irons did not entirely commingle when melted, so that when such a mixture was poured into the mold a preponderating quantity of chilling iron would swirl to one side of the mold and, perhaps, a lesser quantity would find its way to the other side, and the result would be a roll that would be irregular in its chill. This theory was wrong. Another opinion held was that irregular, jerky, pouring of the fluid iron into the roll mold, which might happen through carelessness, would cause the molten metal to rise not regularly, as it swirled around the cylindrical chill mold, but in circular waves, or one large circular wave. That is, that each jerk of a badly handled ladle while pouring, would cause such a wave, and that this was the cause of rolls having one deep chilled side and one shallower chilled side; or as sometimes has been the case, two deep and two shallower chilled sides on the same roll. This also was wrong.

The real and sole cause of irregular or uneven chill on a roll has been established beyond all doubt. First there was a new theory as to the cause and that theory was neither of those that have been noted. This final and correct theory had to be tried, proven, and again and again proven, and finally established by (to this date) over 160 tests. For this number of chilled rolls has been cast by this method begun in May, 1896, and which is in daily practice now at the works of the Lewis Foundry & Machine Co., Pittsburg, and will be continued as their regular method. The United States patent was allowed in November, 1896, and was issued January, 1897, and applications for foreign patents were filed in Canada, England, France, Belgium and Germany, simultaneous with the American application. By this method rolls having any detrimentally irregular depth of chill cannot be made.

But we shall first endeavor to make clear that which is the sole cause of the lack of uniformity in the depth of chill on rolls. Just as soon as a roll mold is filled with molten iron the operation of casting is at an end and the cooling and contraction of the roll within begins; soon after, the molten iron in the upper end of the mold begins to sink, that is, in that surplus portion which is cast on the upper end as a reservoir for the time being, and called the "sink-head," and which is afterward cut off. From time to time as the sinking goes on, fresh molten iron from hand ladles is poured into the sink-head, and thus demand and supply for more hot iron goes on until later, when as no further sinking takes place, no further hot metal is needed. It is now that the iron is passing from a molten condition to solidification. Of course the whole casting is shrinking within its mold. The length is shortening, and in diameter, the body of the roll is leaving the walls of its chill mold. The final and correct theory was, that in shrinking, the roll body did not leave or depart from the walls of the chill mold equally, but that it would often lean more to one side than to the other—that it would "cleave to one and leave the other." If this was correct, then, that side of the chill mold with which the roll body would remain in contact, would produce deep chill on the roll, and that side of the roll body which would depart from its chill mold, would have a shallower depth of chill. Such was the theory; now

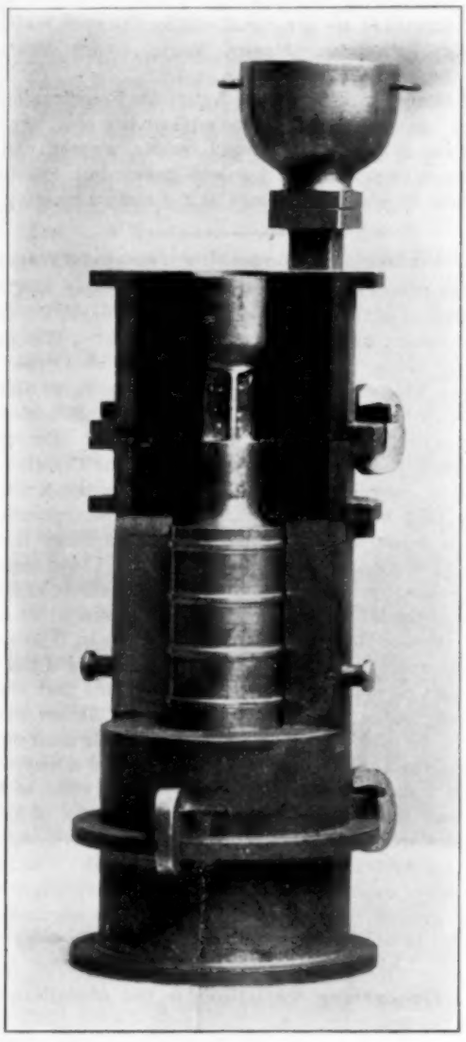


FIG. 1.—INTERIOR OF MOLD SHOWING ROLL AFTER SHRINKING.

for the proof. If all rolls after they are cast, that is not a single moment later, but from the time that the pouring of the molten metal is ended and shrinkage then and at once begins, could be compelled to depart in shrinking, from all sides of their chill molds alike, the molds which form the chill on the rolls would then produce an even, regular depth of chill always, and not result in some rolls having, perhaps, a half inch depth on one side and an inch and a half on the other, and which is the very frequent cause of roll breakage by reason of the unequal expansion and contraction, by heating and cooling when afterwards put in use. The chilled portion of a roll does not expand and contract equally with the open gray iron in the interior of the roll.

No external mechanical means could be devised that would satisfactorily allow or compel a roll when within its mold to shrink away from all sides alike. Whatever means might be resorted to, to be effective, must begin to act from the precise instant that contraction in the roll casting begins, and should

follow it during the period of solidification. The chill on the roll is formed in the earlier part of the period of contraction, and if it is then held centrally within the chill mold, it can in the latter part go as it may, and still not interfere with a uniform depth of chill being formed on the roll.

How to compel a roll while in the earlier part of the period of its contracting, to remain centrally within its mold, and departing, to leave it equally all round, so that during the two, four, six or eight minutes (more or less) in which the chill on the roll is forming, the roll should be sustained

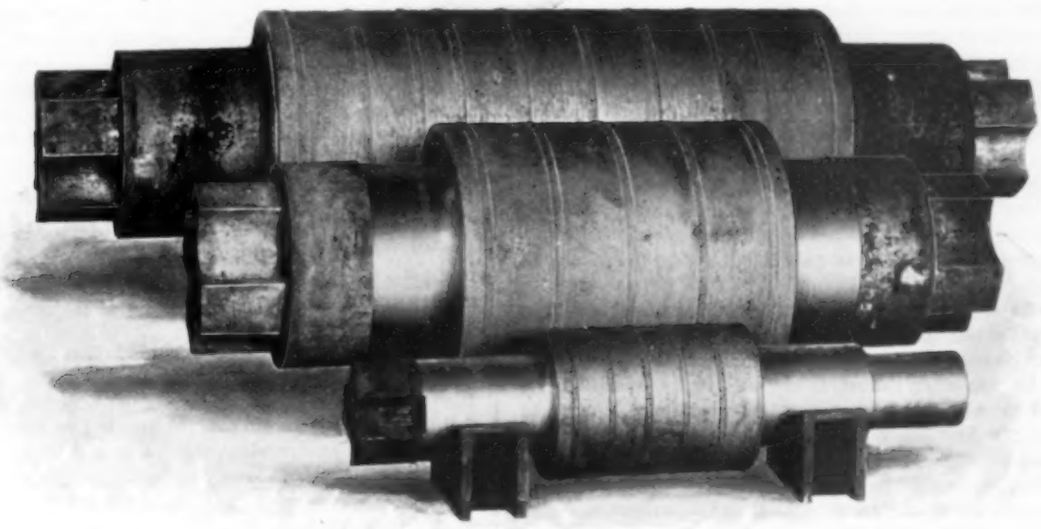


FIG. 2.—ROLLS IN THE ROUGH, MADE BY THE "EVEN-DEPTH" CHILLING METHOD.

equi-distant at all points from the walls of the chill mold, was the problem. The movement of the roll itself in contracting must do it; this alone could be the proper plan. If this could be done then the method would be self-operating, automatic; but with the earliest movement of contraction must begin the even departure of the casting, alike from all sides of its mold. With this idea in operation, all chilled rolls would be made having uniform regular depths of chill. The beneficial result would be a longer life, a far more satisfactory service, than can be obtained from rolls having an uneven depth of chill.

the roll would leave the walls of its chill mold. When leaving its walls, inwardly and downwardly, the beveled edges of the projections on the body, bearing on the beveled edges of the recesses of the mold, would from all sides compel the roll in shrinking, to depart evenly and alike from the walls of the mold toward the center. These would cause the casting to maintain a central position while the chill on the roll was being formed during solidification and contraction. After a number of rolls had been successfully made, a greater number of these notches were added, so that being closer together, more certainty would be established. This was done and the result was still better. Next, if a series of closely formed notches served well, why not make a continuous recess—a small groove around its circumference on the inner wall of the mold? This was done and the ridge or band thus formed on the upper end of the roll body served even better than all else. Now, as long and short rolls are, from time to time, cast in the same chill mold, why not make a number of small grooves on the inner side of the mold—say from the middle to the top, to form an equal number of ridges or bands, on the

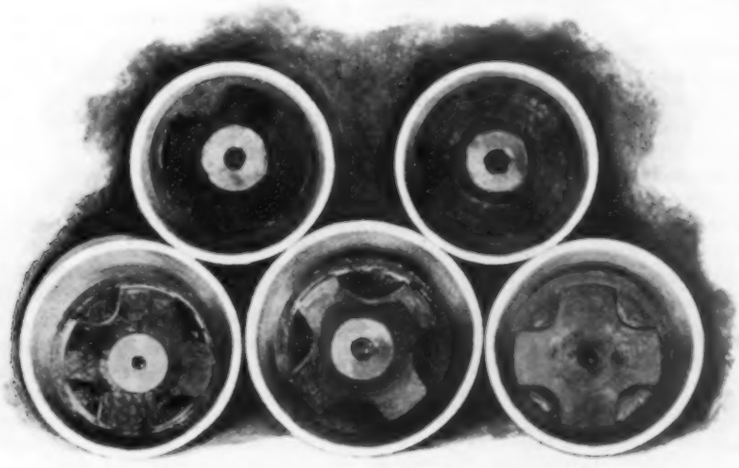


FIG. 3.—VIEW OF SINK-HEAD ENDS SHOWING UNIFORMITY OF CHILL MADE BY "EVEN-DEPTH" CHILLING METHOD.

With this object in view, the usual "chills" in which the bodies of the rolls are made, had a number of notches or recesses formed on their inner surfaces and near to their upper ends, so that when the cast should be made, these notches would form corresponding projections on the surfaces of the roll bodies. These projections were made to have their lower edges beveled or inclined downwardly, so formed by the shape of the recesses that produced them. Now, as the roll made in such a chill mold would begin to sink at its upper end, it would at the same time diminish in diameter; in other words, roll body? This was also done and the result was a perfect roll. The means here described of supporting the roll during contraction, also prevents the rupture or cracking of the surface, and admits of the use of stronger irons, higher in shrinkage than weak irons, hence adding to the strength of the rolls.

Note, particularly, that any projection that may be cast on the surface of a chilled roll must not project from its body to such a degree as will prevent the chill mold from being lifted up and off from the roll casting, as it stands in the casting pit, after the roll has cooled and contracted within.

As chilled rolls are now made in this improved manner, with a number of ridges or bands around the surface, these ridges stand out on the largest roll not above $\frac{3}{16}$ of an inch and less on smaller rolls. All rolls so made are of uniform depth of chill, and in addition are very nearly always of the same depth at each end of the roll; not as formerly, always deeper in the lower end of the roll than in the upper or sink-head end.

By a little study of the mold as it has here been described, and herein illustrated, it will readily be seen that it would be impossible to make any chilled roll in such a mold, having an uneven depth of chilled surface, for the reason that from the surrounding cylindrical chill mold, the contracting hot roll is compelled to depart equally, and at the very instant contraction begins. As it departs the beveled edges on the inner surface of the iron mold, acting on the beveled edges of the ridges on the body of the roll, keep the mold in touch with the shrinking roll until solidification of the chilled surface has taken place, and a surprisingly true, round casting is produced which will require, when in the lathe, very little surface cutting to finish it; $\frac{1}{16}$ of an inch will suffice to make such a roll true.

A uniform, regular depth of chill on any roll, is a positive merit. If a roll has a preponderance of chill on one side, there will be unequal expansion and contraction in the heating and cooling when the roll is in use. This will necessarily work mischief sooner or later. The breaking may not take place in the first week or first month of its use; but it will take place. The service of that roll will come to an end sooner than if the chill had been of proper, even depth. If a roll has too great a depth of chill and is irregular, it will break sooner than one of less chill and regular—all else being equal. Why is this?

The reason is simple and plain. Chilled cast iron is crystalline; gray iron is granular. Crystallized iron is weaker than gray cast iron. If two pieces of cast iron, one crystal (white), and the other granular (gray), be taken and subjected to continued concussion or vibration, the crystalline will reach its end before the granular. This is for the reason that at the beginning, the white iron was by its physical structure nearer the breaking point than was the gray. That is, the piece of gray iron if subjected to continued concussion or vibration, would have to be subjected a much longer time until the breaking would take place, for the reason that it would have to change from the softer gray condition to the harder white, before a weaker state would be reached, but it certainly would be arrived at.

In this matter we have reference to transverse strength of cast iron only, as the subject of this article is rolls, and rolls are never subjected to tensile strain, and only at times to severe torsional strain; but always when in use, to severe and sometimes the severest, transverse strain.

Then, again, that an uneven depth chilled roll will not roll with thickness the finer gauges of sheets, as will a roll that is regular in its depth of chill, is matter well known to rollers. It is on account of the unequal expansion of the unbalanced chilled and gray iron which forms the body.

Cast Iron Prejudice.

The day seems to be past when cast iron is to be considered always and necessarily the inferior metal simply because the cheapest. It is not now, at least in the casting, the cheapest metal, so that the temptation to use it in improper places has largely disappeared, and it has a better chance to find employment upon its merits. We have seen many cast-iron connecting rods for steam engines, some upon tugboat engines, and we have seen a 48-inch lathe with cast iron for the main spindle. The day of these things is gone forever, but the same day saw the cast-iron crosshead pin in almost universal use, and it would be hardly safe to say that anything has yet been found better adapted for that service. Those pins used to stand the wear remarkably well. Although cast solid with the crosshead, and therefore not renewable, they would often last for many years. At the present time we happen to know of a line of machinery in which is used a steel crosshead pin, a straight pin held at both ends with the connecting rod working on the portion of the pin between. The pin wears quite rapidly in spite of all the care that may be exercised. It is seriously proposed to put in a cast-iron pin instead of the steel one. It would certainly wear much better than the steel, and it would be sufficiently strong, so that there would not be the least probability of its breaking; but the machine builder still hesitates to adopt the cast iron, fearing that it will injure the sale of the machine, and that he will be said to be using inferior material in construction. There are other places where cast iron as a wearing surface might be profitably adopted, but where it is not used on account of this still surviving prejudice. We have not yet heard of any of our big steel shafts being coated with shells of cast iron at the journals, and we, of course, are not rash enough to suggest it; but if anyone has the hardihood to try it, we will not be surprised at his success and satisfaction. We at least hope and expect that cast iron will survive all prejudices.—[American Machinist.

Lower Prices for a Coke By-Product.

In view of the prospect of increased production of sulphate of ammonia in the United States through the introduction of by-product coke ovens, the following from an English exchange as to the course of prices in that commodity is interesting:

"A correspondent has pointed out that the serious shrinkage in the balances carried forward in recent half-years by the Gas Light & Coke Co., of London, is attributable to the fall in sulphate of ammonia. According to Messrs. Bradbury & Hirsch's annual review, the average price of that by-product, of which the company is by far the largest producer in the world, was only £7 18s. 0¼d. per ton in 1896, compared with £9 15s. 4½d. in 1895 and £13 3s. 8½d. in 1894. The fall in values was to a great extent brought about by the vain attempt on the part of the Gas Light & Coke Co. to stem the falling tide in the autumn of 1895. They piled up stocks, and have since had to pass through the fire. The difference in the selling value on an output exceeding 30,000 tons per annum has caused a large deficiency, and although sulphate of ammonia has recovered from £7 6s. per ton, the lowest figure on record, reached in October last, to about £8, the correspondent in question points out that the probabilities are that increasing production, especially from sources other than gas, and cheap nitrate of soda, will permanently preclude a return to anything like the level of past years. If this be true of gas companies, it is to be feared that it will prove to be equally true of the by-product recovery systems of coke ovens and the Scotch blast-furnace plants.

Will Curtail the Use of Cotton Ties.

Better methods of baling cotton are now attracting attention in cotton-growing, cotton-handling and cotton manufacturing circles. The plans that have been matured for introducing the cylindrical baling system, after several years of preliminary work indicate that in the near future the whole method of cotton-handling will be improved, and that all cotton must be better baled and better handled, whether it be compressed by the old system or by the new. The new system puts up a round bale of uniform size and weight, that has proved to be almost fire-proof, in active operation. The new system must work to the great advantage of the cotton-growers, because clean, well-baled cotton will always command the highest market price. Edward Atkinson, in a treatise upon "The Cotton Fibre and Its Improvement," has said: "The man who first conceived a cylinder bale, made lap by lap, with the air excluded, has done more to modify and improve the treatment of the cotton throughout its course from the field to the fabric than any man who has existed since Whitney invented the cotton gin." The last issue of the *Manufacturers' Record*, of Baltimore, devotes five pages to an illustrated description of the new system, as compared with the old, and in closing says: "The mechanism for making round, rolled bales of cotton at last has been brought to such practical perfection that its almost immediate general use may be set down as a foregone conclusion."

A FIRE broke out in the storeroom of Park Bros.' mill, Pittsburg, Feb. 22, and the machine shop of the mill was damaged to the extent of $500, and finished material worth $1,300 was destroyed.

MINING ENGINEERS AT CHICAGO.

The 27th annual meeting of the American Institute of Mining Engineers was held in Chicago on Feb. 16, 17 and 18. The headquarters of the Institute during the meeting were at the Auditorium Hotel, and all but one of the business sessions were held there. About 100 members of the Institute were present. The arrangements for the entertainment of the out-of-town members were in the hands of a general committee composed of all the Chicago members of the Institute, of which Robert W. Hunt was chairman and James F. Lewis secretary. The sessions of the Institute were presided over by E. G. Spilsbury, the president. The first session was held on Tuesday evening, at 8 P. M., at Kimbal Hall, and other sessions were on Wednesday at 9 A. M., and at 2 P. M., and on Thursday at 9 P. M., at the Auditorium Hotel.

The papers read at the different sessions were as follows:

The Geology of the Magnetites near Port Henry, N. Y.; and especially those of Mineville, by J. F. Kemp, New York City.

The Precipitation of Gold by Zinc-Threads from Dilute and Foul Cyanide Solution, by Alfred James, Glasgow, Scotland.

The Manganese-Deposits of the Department of Panama, Republic of Colombia, by E. J. Chibas, New York City.

Biographical Notice of Jos. D. Weeks, by Alfred E. Hunt, Pittsburg, Pa.

Biographical Notice of Dr. Alexander Trippel, by R. W. Raymond, New York City.

Current Theories of the Hardening of Steel. A discussion of Mr. Sauveur's paper on the micro-structure of steel, etc., by F. Osmond, Paris, France.

Discussion of Mr. Sauveur's paper on the micro-structure of steel and the current theories of hardening, by Prof. Ledebur and others.

The Distribution of the Precious Metals and Impurities in Copper, and Suggestions for a Rational Mode of Sampling, by Edward Keller, Baltimore, Md.

Sulphur in Embreville Pig-Iron, by Guy R. Johnson, Embreville, Tenn.

The Handling of Material at the Blast Furnace, by Axel Sahlin, Sparrows Point, Md.

The Spitzkasten and Settling-Tank, by H. R. Richards and C. E. Locke, Boston, Mass.

Sorting before Sizing, by R. H. Richards, Boston, Mass.

The Calorific Value of Certain Coals as Determined by the Mahler Calorimeter, by N. W. Lord and F. Haas, Columbus, O.

The Chicago Drainage Canal, by J. F. Lewis, Chicago, Ill.

Influence of the Metalloids Sulphur, Phosphorus and Silicon in Cast-Iron, by Guy R. Johnson, Embreville, Tenn.

The Genesis of Auriferous Lodes from a Chemical Point of View, by Prof. John R. Don, Dunedin, New Zealand.

Direct Generation of Electricity from Carbon, by R. H. Sanders and H. M. Chance, Philadelphia, Pa.

Note on the Determination of Insoluble Phosphorus in Iron Ores, by Howard W. DuBois and Charles T. Mixer, Philadelphia, Pa.

Mining Methods in Northern Minnesota, by Prof. F. W. Denton, Minneapolis, Minn.

Preliminary Note on the Working of Edison's Briquettes in the Blast-Furnace, by Leonard Peckitt, Catacauqua, Pa.

Analysis of Waters of Illinois, by J. A. Carney, Aurora, Ill.

Discussion of Prof. Christy's paper on the Solution and Precipitation of the Cyanide of Gold, by Alfred James, Glasgow, Scotland.

Presidential Address, by E. G. Spilsbury, Trenton, N. J.

On Wednesday evening a large reception was given to the members of the Institute and their ladies at the Technical Club by the members of that club. This was a very enjoyable occasion, and was in a sense, the opening of the club to the out-of-town people, as it was the first public reception the club has ever had.

On Thursday evening, at 7 o'clock, a subscription banquet was given, which was presided over by Capt. R. W. Hunt as toastmaster. After the banquet was served the following named gentlemen responded to the toasts given: E. Gybbon Spilsbury, Our Retiring President; James F. Lewis, The Ladies; E. W. Parker, Figures and Facts; R. H. Richards, Our Past Presidents; Capt. W. H. Jaques, Great Guns; Ossian Guthrie, Old Chicago; Dr. R. W. Raymond, Good Old Times. About 60 members and ladies attended the dinner.

On Thursday afternoon a party of about 150, including the members of the Institute and their friends, went on a special train furnished by the Illinois Central Railroad to the Field Columbian Museum. On Friday morning an excursion was given to the shops of the Illinois Central Railroad at Burnside, and to South Chicago to inspect the works of the Illinois Steel Co. At the latter place a luncheon was served by the Illinois Steel Co. to the members and their guests.

Especial mention should be made of the work of Chas. E. Billin, secretary of the Technical Club, and George P. Nichols, who were on the entertainment committee, and James F. Lewis, secretary of the general committee, in making arrangements for the entertainment of the out-of-town members of the Institute. That their efforts were appreciated is evidenced by the expressions of pleasure from the members, at the reception and entertainment given them by Chicago.

The election of officers for the ensuing year resulted as follows: President, Dr. Thomas M. Drown, South Bethlehem, Pa. Vice-presidents, D. W. Brunton, Aspen, Colo.; W. E. C. Eustis, Boston, and James Douglas, New York. Managers, C. W. Goodale, Butte, Mont.; Frank Lyman, Brooklyn, N. Y., and Frank McM. Stanton, Houghton, Mich. Treasurer, Theodore D. Rand, Philadelphia. Secretary, Rossiter W. Raymond, New York.

BESSEMER INGOTS AND RAILS IN 1896.

From the last issue of the *Bulletin* we take the following statistics collected by the American Iron and Steel Association, showing the production in the United States in 1896 of Bessemer steel ingots and Bessemer steel rails, except the comparatively small quantity of standard rails and street rails which were made by manufacturers from purchased blooms. In the statistics of ingots produced are included the production of the few Clapp-Griffiths and Robert-Bessemer plants, and also the production of steel castings by all Bessemer works and the single Walrand-Legenisel plant at Chicago.

Ingots.—The total production of Bessemer steel ingots in 1896 was 3,919,906 gross tons, against 4,909,128 tons in 1895, showing a decrease in 1896 of 989,222 tons, or over 20 per cent. The production of 1895 was much the largest in our history. The following table gives our production of Bessemer steel ingots in the last ten years.

Years. Gross tons.	Bessemer ingots.	Years. Gross tons.	Bessemer ingots.
1887	2,936,033	1892	4,168,435
1888	2,511,161	1893	3,215,686
1889	2,930,204	1894	3,571,313
1890	3,688,871	1895	4,909,128
1891	3,247,417	1896	3,919,906

The following table gives the production of Bessemer steel ingots by States in the last four years:

States—Ingots.	1893. Gross tons	1894. Gross tons.	1895. Gross tons.	1896. Gross tons.
Pennsylvania	2,126,210	2,334,548	2,978,924	2,291,814
Illinois	314,829	581,540	866,511	780,105
Ohio	348,141	363,974	719,954	568,535
Other States	426,496	291,251	343,719	278,452
Total	3,215,686	3,571,313	4,909,128	3,919,906

Rails.—The production of all kinds of Bessemer steel rails by the producers of Bessemer steel ingots in 1896 was 1,102,892 gross tons, against a similar production of 1,266,081 tons in 1895, 904,020 tons in 1894, 1,036,353 tons in 1893, and 1,458,732 tons in 1892. The following table shows the production by States, of Bessemer steel rails by the producers of Bessemer steel ingots in 1893, 1894, 1895 and 1896:

States—Rails.	1893. Gross tons.	1894. Gross tons	1895. Gross tons.	1896. Gross tons.
Pennsylvania	631,431	606,866	837,013	663,096
Illinois	231,210	225,869	324,050	310,847
Other States	164,662	71,285	104,988	128,949
Total	1,036,353	904,020	1,266,081	1,102,892

THE Pennsylvania Steel Co. has just filled an order for 100-pound T-rails for the Pennsylvania Railroad. Heavy tonnage was made in filling the order.

GEAR MOLDING AND ITS MACHINES.*

BY S. GROVES, M. E.

When the philosophic historian comes to write the industrial history of the latter part of this 19th century, not the least important chapter will be the interesting story of the renaissance of iron-founding; and when he endeavors to divine the causes which gave the momentum to this revival, he will probably point, in the first place, to the invention of the geared ladle by Nasmyth in 1838 as the first application of practical mechanics tothe economic handling of material in the foundry, and to the invention of the first gear molding machine by Jackson in 1855 as the primary effort of the iron founder to reduce his rule of thumb and guesswork practice to the exactitude and precision of a science. For many years after the invention of these initial appliances, very little progress was made in the adoption of labor-saving devices, and mold forming machines, for duplicate work. During the last decade, however, a marked change has come over the scene. There is as much difference between the foundries of Philadelphia to-day and the foundries of my boyhood, as there is between the miserable horse car—which is fast becoming a curiosity—and the brilliantly lighted, finely furnished and rapid-running electric cars of our modern

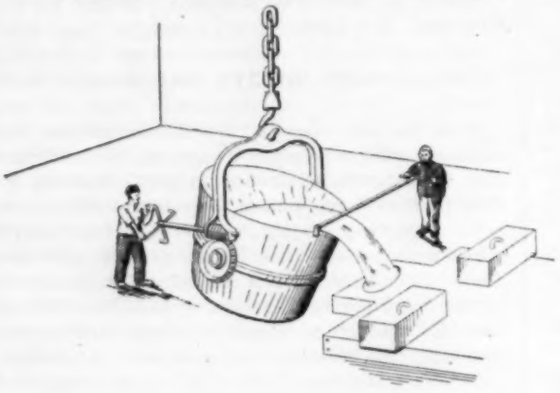


FIG. 1.—NASMYTH'S LADLE.

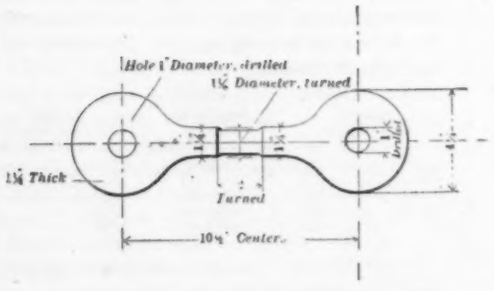


FIG. 3.—TEST BAR USED IN MELTING ENGLISH IRON.

streets. Indeed, I was greatly tempted at this point to dilate upon the general subject of modern foundry appliances; but, inasmuch as the limited theme of gear molding and gear molding machines has been allotted to me, I must observe the discipline of the convention, and confine my remarks to this special branch of founding.

A year ago, it was my privilege to read before the Foundrymen's Association in this city (Philadelphia) an essay on "Machine Molding, with Special Reference to the Manufacture of Gears," in which I described with illustration the molding of gear wheels by machinery; contrasting this new and scientific method with the primitive custom of hand molding—by means of expensive full patterns. And since I can not report any new discoveries in this important branch of trade during the intervening twelve months, it only remains for me to supplement the generalities then stated with some particulars and practical details noted in the process of actual manufacture.

The common method of molding a worm is to form the mold by means of a pattern made in halves. Now, these pattern halves can not be withdrawn from the sand direct, owing to the overhang of the threads; they must be twisted out. Any one who has tried to do it knows how difficult it is—patching and mending invariably follow. This trouble, together with the enlargement of the mold, due to rapping, added to the unsightly fin which appear on the casting at the parting of the pattern, render this old plan altogether unsatisfactory. But the machinery molder has completely overcome these difficulties by bringing to his aid a simple mechanical appliance. A brass pattern is chased in the lathe, having the necessary allowance for contraction. This pattern, with tapered core print at lower end and tapped hole in top for receiving fitting rod, is set vertically in the flask, hand-packed with suitable facing, rammed around, and strickled off. This done, a plate having hole in center of same shape and rake as thread of worm, also a cross bow with guiding gland in middle, is secured to top of flask. The lifting rod, with left-handed screw, is then inserted into the pattern, and the pattern screwed out of the mold up through the slot in cover plate, the mold of each thread being self-slecked in the process of withdrawal. The cope is then put on and the mold poured. Thus, by a simple method of machine molding, duplicate worms, perfectly smooth and true, can be cast in greatly increased quantities and at comparatively small cost.

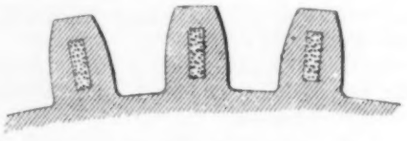


FIG. 2—MODE OF VENTING TEETH.

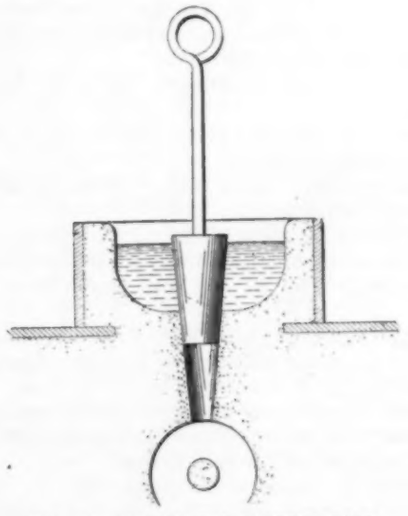


FIG. 4.—STOPPER FOR POURING GATE.

Again: Why endure the slow and costly process of cutting the teeth of smaller duplicate gears in the machine shop, when, by means of a cut toothed iron or brass pattern, fixed on a drawback mold forming machine, a laborer can make these gears almost as fast as a skilled molder can turn out the blanks! And what is more, the teeth will have the advantage of the hard skin for a wearing surface, which is removed when the teeth are cut out of the blanks in a lathe.

We now come to the molding of gears of magnitude, and in dealing with this part of my subject, I may say, at the very outset, that when you know how, the molding of gears up to, say, 6 feet diameter on a revolving table machine is, like the machine molding of worms and small gears, a very simple process. A common laborer can soon be trained to do the work perfectly. After he has once made successfully a spur, bevel, helical or worm wheel, the process in each subsequent case is very similar, and the man becomes practically part of the machine. When, however, we come to the machine molding of heavy wheels over 6 feet diameter—which must be made in the floor, and not on a table machine for fear of injuring it as an instrument of precision—then we are confronted with an altogether different condition of things. The common laborer is no longer available; the molder must be, in every sense of the word, a mechanic. Take, for example,

*From an address before the first National Convention of American foundrymen, in Philadelphia. Reprinted from the February number of the Journal of American Foundrymen's Association.

a double helical gear 14 feet diameter, 4½-inch pitch, made in halves by means of splitting plates. In the first place, there must be heavy anchor foundations, covered with a layer of sand, then a coke bed with vent pipes for conveying off the gases generated under the mold; then another layer of hard rammed sand, upon which is built a brick wall; and a point of importance is that these bricks should be porous. The portable molding machine is then fixed, sweep adjusted, and the mold bottom properly leveled and swept. Then commences the interesting process of machine molding the teeth. A laborer operates the drawback machine and index, inside the ring, while the molder, standing outside the wall, leans over, and rams the teeth. Here comes into play the skill and resource of the experienced molder, for, in selecting his facings, several important conditions have to be observed. The fine grained sands which he used for 1-inch pitch will not do for teeth 4½-inch pitch, the particles of silica in the sands must be coarser, in order to render the facing porous, and thus allow for the free exit of the gases; it must be sufficiently cohesive to mold well and resist pressure, and sufficiently refractory to prevent the burning action of the hot metal. Further the molder, in ramming the teeth, must be able to judge exactly the necessary degree of force to impart to his rammer; the force applied in forming the tooth spaces for 1-inch pitch will not do for the larger sizes; and besides, the ramming must be uniform since a hard spot here and a soft spot there, will tell its miserable tale when the gear is lifted out of the sand, either in unsightly scabs or ugly swellings, necessitating the use of hammer and chisel. And I may remark here that in molding the teeth of large gears of 3-inch pitch and upwards, it has been found necessary to vent the mold of each tooth space, by leaving an oblong hole in the middle, which is connected to the coke bed below by a vent wire and filled with fine particles of coke. Teeth molds formed in this manner, afterwards coated with a refractory solution, and thoroughly skin dried, not by the erratic heat of a coal or coke fire, but by a steady, regulated gas flame delivered through small holes in a 1-inch tube ring—about 12 inches less in diameter than the mold—will produce teeth with sharply defined edges, and flanks bright, smooth and clean.

Another important improvement in manufacture is the substitution of green sand for dry sand arm cores. This is one more instance of necessity being the mother of invention. If a large gear is to be true in diameter, there must be no resistance to general shrinkage. The shrinkage which takes place in the arms towards the hub must be followed by the run between the arms also; anything which hinders this onward movement is detrimental to the diametral perfection of the gear. Hard-earned experience has proved that this is just what dry sand cores are found to do: hinder normal shrinkage. I well remember a deplorable instance of this. It was a large gear, 7-inch pitch 30-inch face, and when cast, a number of teeth were cracked transversely across the face, midway between the shrouds. The use of dry sand cores was manifestly the main cause of this mishap, for the arms were of I section, and as the metal in the top and bottom flanges shrank in towards the hub, it naturally drew the run and whole face of the gear with it; but the hard dry sand cores resisted this, hence the metal in the teeth opened out in the middle. From that time forth I discarded dry sand cores, using only hollow, coke-filled green sand cores, made of coarse gravel or gum sand; and in no instance was the old trouble repeated, for they adjusted themselves to the shrinkage of the environing metal.

Having described the method of forming the teeth molds, selecting facings, and making the green sand arm cores, we now pass on to the question of covering in. In casting a heavy gear it is important that there should be no strain; the slightest uplift of the cope would cause the width of the face to vary and the gear to run untrue. With this danger in mind, flexible wooden copes have been entirely discarded as being liable to twist in lifting and bulge under pressure. Ponderous iron copes have also been altogether abandoned, both on the score of expense and difficulty in handling. The best makers now use strong dry sand covering cores exclusively, a system which represents a manifest advance in the art of molding large gears; it is safe, economical and expeditious. Then there is the question of metals. If ever there was a case where test bars are a necessity, it is in the manufacture of gears, for the buyer insists upon a guarantee that the metal in the casting must stand a tensile strain of 30,000 pounds per square inch!

I may be permitted to say a word at this stage, relative to the discussion we have just had, upon the shape and size of test bars. If I did not take part in the debate it was not because I had no experience, for it was my good fortune to be engaged some few years ago in the systematic testing of almost every brand of pig iron used in the British iron trade, and I have here a record of over 1,000 tests, both transverse and tensile, which I conducted during the four years ending 1888. The form of test bar used was as shown in Fig 3; the middle was turned and the pin holes drilled perfectly at right angles to the center of the turned section, in order that the strain should be in the direct line of the applied forces.

There may be objections urged to this shape of test bar, but, in my opinion, it is greatly to be preferred to the square-ended test bars commonly used by American foundrymen, which are held in the machine between file-faced grips. After the faces of these grips become worn, slipping takes place, and I verily believe that many of the erratic records presented to us of tensile tests is due to twisting and cross straining due to this defective system of testing. The only trouble we ever had with these bars was the congregating of blow holes in the narrow neck. This trouble was overcome, however, by ramming up the molds horizontally, but casting the bars vertically—pouring from the bottom. The pouring gate at the top (Fig. 4) was filled with the calculated quantity of metal, the plug was withdrawn and the metal rushed down the gate hole to the bottom of the flask up through the mold, carrying the confined air and gases before it, and thus insuring a clean casting.

The metal for a gear should be as close-grained as possible, especially in the teeth, since a skin of fine grained combined carbon offers the best wearing surface; yet must not be chilled, as in many cases the shrouds must be turned, the hub bored and keyseated in the machine shop, hence must not be too hard for the tool. It is of vital importance, therefore, that the gear founder be capable not only of scientifically grading his facing sands to suit the varying magniture of his castings, but, for a like reason, must have an exact knowledge of the selection of metals by analysis. A metal mixture containing 2½ to 3 per cent of silicon would be suitable for a gear of 1-inch pitch, but would be useless for a large gear of 7-inch pitch, in which the mixture should contain an average of about 1½ per cent of silicon. Another condition worth noting is, that if the casting is to be sound and the teeth sharply defined, the metal poured into the mold must be hot—at a high temperature. With lively metal the gases generated in the mold can be easily expelled, and owing to its fluidity shoots quickly out of the hub, along the arms, into the run and teeth around the circle, filling every nook and corner in the mold,and producing teeth with the knife edge appearance which the gear molder who takes a pride in his work likes to see.

The only difference between the molding of large gears in the floor and smaller gears on the table machine is that in the case of the latter they are manufactured in interchangeable cast iron flasks, both cope and drag, having perforated bodies, planed joints and carefully fitted double tapered guide pins. . . .

. If we could all emulate the noble, self-denying spirit displayed by James Nasmyth, the inventor of the geared ladle, the onward march of progress in the art of founding would be wonderfully accelerated. Prior to his invention, the old style ladles were tilted in the act of pouring by men holding on to the handles by sheer manual strength, and frightful accidents occurred. By his device of worm and gear not only was all risk of accident removed, but the perfection of the casting was assured by the steady, continuous flow of the hot metal into the mold, while by means of the lip skimmer a clean flow of metal was secured. He says in his autobiography—a book which every machine shop and foundry apprentice in the country should read: "I might have patented them, but preferred to make them over to the public. I sent drawings and descriptions of the safety foundry ladle to all the principal founders both at home and abroad, and I was soon after much gratified by their cordial expression of its practical value. The ladle is now universally adopted."

In conclusion, Mr. Groves gave a description of his own gear molding machine, now patented, which was illustrated and described in *The Iron Trade Review* of Jan. 14, 1897.

"FLOWED" STEEL IN BOILER SERVICE.

The two illustrations show samples of a new departure in the making of alloys or mixes for high grade steel castings. Something over a year ago the Aultman & Taylor Machinery Co., of Mansfield, O., started to have a series of experiments made with a view to obtaining a mix for steel castings which should equal if possible in its chemical and physical properties the best boiler plate. After a long series of expensive trials the mixture illustrated was discovered.

Owing to the high price of some of the alloys used, castings made by this process are expensive, costing from 6 to 8 cents in the rough, but for the particular purpose for which they are designed it is much cheaper to use even at this price than the ordinary steel castings at less than half the cost.

Castings made by the "flowed" steel process are free from flaws, defects or blow-holes, and are uniform in their texture. Every piece of the metal has an elongation of not less than 25 per cent and a reduction in area of not less than 50 per cent with an 8-inch test piece. Some of the samples have shown an elongation of 31 per cent and a reduction in area of over 60 per cent. The metal can be worked cold as well as or better than steel plate.

The basis of the mixture is open-hearth steel of the best quality. "Flowed" steel is used by the Aultman & Taylor Machinery Co., in manufacturing cross-boxes, flanges, etc., in its Babcock & Wilcox type of boilers. Where this type of boiler is manufactured for a working pressure exceeding 225 lbs. to the square inch, it is also used in the "headers" or manifolds into which the boiler tubes are expanded.

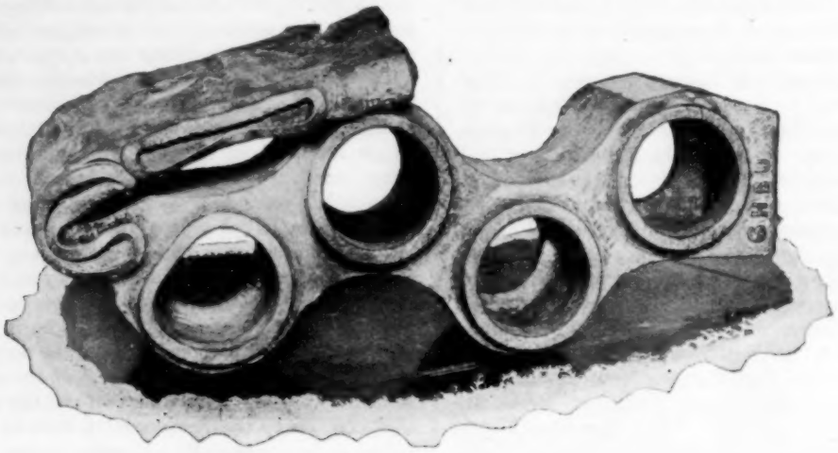


FIG. 1.

Fig. 1 shows a header of this type, six tubes high. It will be noticed that the header for a space of two tubes in length has been flattened out and then bent back on itself, a test more severe than steel forgings are subjected to. A header made in this manner possesses two very material advantages over a header made of forged steel.

1. There is no weld to be made, which avoids one great element of weakness in forged headers. 2. The walls of the header can be thickened at will where the strain incident to its use requires greater strength than at other points. This is desirable at all corners in the header, as the strains are greatest there. With the forged steel header the process of manufacture tends to thin the metal at these points of greatest strain. The same holds true in regard to cross boxes or cadles on the drums of boilers for the reception of the nipples connecting the drums to the headers.

Fig. 2 shows samples of borings and turnings from castings made under the "flowed" steel process in the ordinary course of manipulation under the tools. These were photographed as taken from the scrap pile without any special effort to obtain samples out of the ordinary. The four small straight pieces shown are drillings from a ⅝-inch hole.

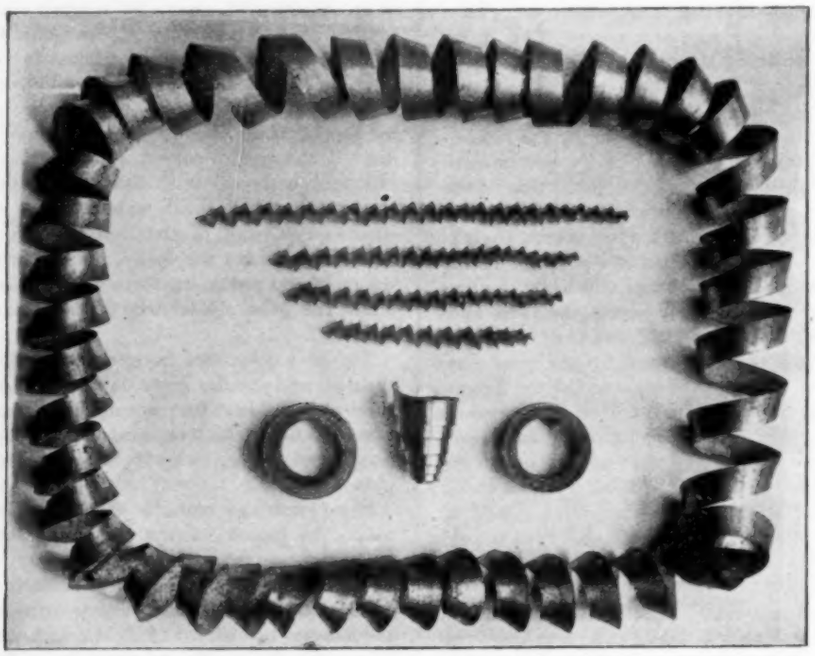


FIG. 2.

W. L. B. JENNEY the Chicago architect, has been notified by F. T. Gates, president of the Bessemer Steamship Co., that a steamer now building at Bay City, Mich., for the Rockefeller fleet, is to be named the W. L. B. Jenney in his honor. This is done as a mark of appreciation of Mr. Jenney's services in connection with the invention and introduction of the steel skeleton system of building construction

THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, Feb. 17, at the Great Northern Hotel, Chicago. The president, A. W. McArthur, was in the chair.

The following were present:

A. W. McArthur, Rockford Foundry Co., Rockford, Ill.; F. M. Lyons, Burlington Route Foundry, Aurora, Ill.; E. B. Hanna, Wm. Ferguson, Gates Iron Works; John Pettigrew, John Featherstone Sons; W. M. Thompson, Link Belt Machinery Co.; R. C Barr, Cleveland & Barr; C. W. Jackson, C. K. Pittman; E. W. Smith, Crane Co.; W. L. Lukens, Illinois Malleable Iron Co.; W. D. Barton, Siemens-Halake Co.; H. F. Frohman, J. B. Evans, S. Obermayer Co.; H. L. Hotchkiss, F. G. Coffeen, J. W. Litchfield, G. H. Ellis, Deering Harvester Co.; S. T. Johnston, Whiting Foundry Equipment Co.; W. L. Getchell, Joseph Dixon Crucible Co.; B. M. Gardner, *The Iron Trade Review*; J. H. Dalton, Walburn-Swenson Co.; R. S. McPherran, E. P. Allis Co.; J. Strass, Shone Co.; Henry W. Carter; A. Sorge, Jr., Cons. Eng.; all of Chicago.

The secretary read the following applications for membership in the association: Max H. Wickhorst, C. B. & Q. Brass Foundry, Aurora, Ill. (active); Peter Marshall, of the Hansell-Elcock Foundry Co., Chicago (active); Joseph Dixon Crucible Co., Jersey City, N. J. (associate). Upon motion the applicants were elected members of the association.

The secretary then read the amendments proposed to the by-laws at the preceding meeting and also the corresponding by-laws as they exist. On motion the proposed amendments were considered section by section. There was some discussion on these amendments, but on motion duly made for each section they were all rejected. The vote against the amendments was thoroughly unanimous, and after they had been disposed of, the president made a few remarks calling attention to the unanimity of sentiment in rejecting the proposed amendments, and asking that since they were now disposed of and the association had shown its desire to work under the by-laws, every member should put his shoulder to the wheel and labor conscientiously for the good of the association and the advancement of its objects.

The next business in order was the discussion of topical question No. 8, which reads as follows: "What is the proper amount of air, and pressure of same, to melt iron in cupola, and what are the effects of too little and too much air?"

Mr. Sorge: In the proportioning of tuyere areas for cupolas and the size of blower necessary, the ordinary practice is to assume a consumption of 2,500 pounds of air for 2,000 pounds of iron melted. This is on the assumption of about 8-ounce blast pressure and a melt of 7 pounds of iron per pound of coke.

Mr. Smith: As to the exact weight and pressure of blast required in a cupola, I have no actual figures, and I believe that any figures assumed are merely theoretical. My experience is that 8 ounces is about the best blast pressure. In one foundry with which I was connected, we used a No. 7 Sturtevant fan running at 2,200 revolutions, but a No. 8 fan running at 2,000 revolutions, or a No. 9 fan running at 1,900 revolutions, would accomplish the same purposes. Too little blast does very little harm, but too much blast is liable to do considerable harm. Particularly is this the case at the beginning of the heat, and especially with soft iron. Excessive blast melts faster, but produces colder iron and has a tendency to harden same. My experience is that the iron coming from the cupola is usually hard at the beginning of the heat and gets softer later, even where the same charges are used right through.

Mr. Pettigrew: For many years I used a 48-inch cupola which had eight 5-inch round tuyeres and used a No. 7 Sturtevant blower running at 2,300 revolutions, producing a blast pressure of 9 ounces. My experience is that when the cupola is dry and in good shape the iron is softer at the beginning of the heat. In car-wheel foundries where heats of 36 to 40 tons are taken off they charge more hard iron in the middle of the heat than either at the beginning or at the end.

Mr. Dalton: In my experience I have seen cold iron come at the first tap of the cupola while the iron became hotter as melting continued. I believe however, that this was due more to the condition of the cupola than to the amount of air used.

Mr. Smith: The iron in the cupola trickles through the charge in a similar manner to water trickling through a sponge, and when an excessive amount of blast is used, the iron is exposed to the action of the oxygen in the air and there is a tendency of hardening the iron by burning out some of the silicon. I have also found that an excessive amount of air chills the charge at the opening of the tuyere, thus preventing good circulation of the air through the charge in the cupola, and consequently also preventing thorough melting.

Mr. Coffeen: I have had some experience with the melting of iron for car-wheels. Where I worked we found it necessary to use more softener at the beginning of the heat than later, as we invariably had harder iron at the first tap than at subsequent ones.

Mr. Hanna: We have a 32-inch, a 40-inch and a 60-inch cupola. We use 15 to 16 ounces blast. In the 32-inch cupola we melt about 4 tons per hour, in the 40-inch about 6 tons per hour and in the 60-inch about 12 tons per hour. Into the 32-inch cupola we blow 3,520 cubic feet of air per minute. Into the 40 inch cupola we blow 5,480 cubic feet per minute and into the 60-inch cupola we blow 7,920 cubic feet per minute. The 32-inch cupola runs on hard iron for chilled work. The other two run on gray iron. If 2,500 pounds of air melts 2,000 pounds of iron, we are using a very excessive amount of air.

Mr. Ferguson: I cannot tell just what the quantity of air is that should be used, but I know that I use as much air as I possibly can. I never had too much. It may be that the engineers in designing a plant so proportion the blowers that we could not get an excess, but, up to the limit of the blower capacity, I want all the air that can be obtained. As I increase the amount of blast, I find that I increase the speed of melting. I find that our iron is harder at the beginning of the heat than later and I know that car-wheel foundries have the same experience.

Mr. Smith: Mr. Ferguson's class of work and mine are very different. He makes heavy gray iron castings, while I make very light work. This may possibly explain why our experience varies.

M. Dalton: I find that we never get too much air and I need very hot iron to do the work in our foundry. But my experience shows that I get cold iron with too little blast.

Mr. Ferguson: About ten years ago I experimented with low blast pressure to my heart's content. In a 30-inch cupola with 8 ounces of blast, I melted at the ratio of 1 to 7, my heats being from 3 to 5 tons easily. I reduced the blast pressure daily and also the amount of coke until I melted with a 4-ounce blast and the ratio of 1 to 11½. I then stopped, as I found that my iron was growing too cold.

Mr. Sorge: When the blast pressure is reduced the volume of air should be increased and therefore the area of the tuyere openings into the cupola should be correspondingly increased. It is my opinion that the blast pressure employed by Mr. Hanna is too high for economical results, and that he would do better by using a lower pressure and increase the amount of opening into the cupola through which the air is introduced. Where the air issues into the cupola under a very high pressure and through a comparatively small tuyere area, it acts upon the fuel something like a blow-pipe, produces intense heat at one spot and burns away the coke rapidly, thus leaving holes through which afterwards the cold air enters and thus reaches the center of the cupola. In my opinion a large volume of air with low intensity of blast is preferable to a small volume of air with high intensity.

Mr. Thompson: I find that one difficulty in judging of the air pressure is that the blast gauge does not tell the story unless you use a positive pressure blower. Where a fan is used the amount of air delivered is not a positive quantity. We have a 54-inch Collian cupola lined up to 48 inches. With a No. 6 Root blower delivering about 46 cubic feet per revolution or 8,000 cubic feet per minute, we melt from 12 to 13 tons in a heat and use about 40,000 cubic feet of air per ton. We consider this a rather large amount. We get no colder or hotter iron by using more blast, but my experience is that we simply melt faster.

Mr. Carter: I am not a foundryman and am not familiar with cupola work. However I have gone over some of the figures given, and I do not find a very great difference. Mr.

Sorge thought 2,500 pounds of air per ton of iron is used. Mr. Thompson's figures show that he used about 3,000 pounds. Mr. Hanna shows that he used about 4,000 pounds of air for a 32-inch cupola, about 4,100 pounds for the 40-inch cupola and about 3,000 pounds for the 60-inch cupola. There is therefore very close agreement in these figures when you consider the difference in blast pressure employed.

Mr. McArthur: It appears to me that the amount of air needed for melting depends largely upon the character of the fuel employed, and I should like to hear from some of the members on the subject.

Mr. Jackson: I think the physical structure of the coke used in melting iron has considerable to do with the quantity and intensity of blast employed. Where the coke is soft, less blast pressure is needed and a greater volume than when the coke is hard. This will then necessarily involve a larger tuyere area for soft coke than for hard coke.

Mr. Hanna: I do not think a fan can be relied upon for cupola work, but that a positive pressure blower is needed. The best results that I have obtained were with a 30-inch cupola, having a 2-inch annular tuyere extending clear round the cupola and in which I used 10 ounces blast pressure and melted 5 tons per hour. I believe that low pressure and large volume of air are desirable when the cupola can be so constructed as to get sufficient tuyere area. There are practical difficulties about getting a sufficiently large tuyere area.

Mr. Ferguson: They tell us that theoretically we should melt 20 pounds of iron to one of coke, but actual results show that on the average we do not exceed 8 to 1. Does this not show that we are not getting enough air?

Mr. Sorge: I hardly agree with Mr. Ferguson in this proposition. The small proportion of iron melted per pound of fuel is due to the fact that, after the fuel is consumed in the melting zone of the cupola, the gas passes up through various layers of fuel and the carbon dioxide which is the product of perfect composition is transformed into the carbon monoxide by the absorption of more carbon. The heat value of this carbon monoxide, or in other words the amount of heat produced by burning of the fuel improperly is very much smaller than that produced by burning the fuel perfectly and forming carbon dioxide. In other words, we are getting in the cupola imperfect combustion and are permitting a large portion of the heat value of our fuel to pass out of the stack. This is the reason why the amount of iron melted in the cupola is so much smaller than theory tells us should be the case.

Mr. Hanna: I think that usually it is more economical to sacrifice fuel in order to save time and other expenses running the cupola.

Mr. Carter: I have made a few more figures on the cupola mentioned by Mr. Hanna. In the case when 4,100 cubic feet of air were consumed, I find that there were about 20 pounds of air used per pound of carbon in the fuel, while they were melting at the ratio of 10 to 1. The theoretical consumption of air would be 13 pounds per pound of carbon.

Mr. Ferguson: I believe we need more air in our cupola, and think we should therefore have larger blowers and more tuyere area.

Mr. Pettigrew: I regret that Mr. Moore of Joliet is not here, as he has had experience in this line which is very interesting. He has a Colliau cupola which was fitted with the usual tuyeres. He formerly used Connellsville coke entirely. During the strike in 1887 he had great difficulty in getting his coke and finally was obliged to purchase coke of a different character and what he considered of inferior quality. He was unable to melt his iron properly, but he finally took out the Colliau tuyeres and cut out large openings, simply increasing the tuyere area in his cupola. He reduced his blast pressure and increased the volume of air and since then has had no trouble whatever to get hot iron in good condition from soft coke.

Mr. Jackson: I believe that one difficulty is that foundrymen are frequently not accurate enough, not knowing the conditions under which they work. Some time since I met two foundrymen running cupolas under like conditions and fitted with the same kind of apparatus. I asked one what blast pressure he used. He stated that he did not know, but that he ran his gauge up to 2 inches, which he thought was about 13 ounces. The other had the same kind of gauge, cupola, etc. He told me that he ran his gauge up to 2 inches and that his pressure was 8 ounces. I only said this to illustrate that frequently foundrymen believe that they are working under conditions different from what actually exist.

The meeting then adjourned.

CONDITION OF BLAST FURNACES OF U. S.*

Feb. 1, 1897.

Location of Furnaces.	Coke and Anthracite					Charcoal.				
	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.	Total No. of Stacks.	In Blast Number.	In Blast Weekly capacity	Out of Blast. Number.	Out of Blast. Weekly capacity.
New York	30	4	5229	16	9652	5	0	0	5	552
New Jersey	8	2	1628	6	1667	.....	.....	.....	.....	.....
Spiegel	3	1	173	2	150	.....	.....	.....	.....	.....
Pennsylvania:						13	1	60	12	685
Lehigh Valley	37	12	7159	25	10257	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	70	.....	.....	.....	.....	.....
Schuylkill Valley	24	8	5687	16	7577	.....	.....	.....	.....	.....
Upper Susqu. Val.	8	2	1475	6	2398	.....	.....	.....	.....	.....
Lower Susqu. Val	9	3	1181	6	3252	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	50	.....	.....	.....	.....	.....
Lebanon Valley	13	4	2847	9	4097	.....	.....	.....	.....	.....
Pittsburgh	26	20	40285	6	9813	.....	.....	.....	.....	.....
Spiegel	2	2	1500	0	0	.....	.....	.....	.....	.....
Shenango Valley	16	5	6 01	11	10861	.....	.....	.....	.....	.....
Jun. and Con. Vals.	14	5	7148	9	4385	.....	.....	.....	.....	.....
Spiegel.	1	0	0	1	550	.....	.....	.....	.....	.....
Youghiogheny Val.	4	1	900	3	1900	.....	.....	.....	.....	.....
Miscellaneous	4	1	619	3	2079	.....	.....	.....	.....	.....
Maryland	5	1	1850	4	5720	4	1	117	3	358
Wheeling District	10	4	5550	6	5685	.....	.....	.....	.....	.....
Ohio:						9	3	198	6	620
Mahoning Valley	11	7	11453	4	4850	.....	.....	.....	.....	.....
Central & Northern	10	5	7170	5	6018	.....	.....	.....	.....	.....
Hocking Valley	12	0	0	12	5120	.....	.....	.....	.....	.....
Hanging Rock	12	6	2171	6	2520	.....	.....	.....	.....	.....
Indiana	2	0	0	2	408	.....	.....	.....	.....	.....
Illinois	16	9	18.91	7	13300	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	1000	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	1	876	3	3081	2	1	826	1	366
Missouri	2	0	0	2	1100	1	1	361	0	0
Colorado	3	0	0	3	4640	.....	.....	.....	.....	.....
Virginia	24	9	6010	15	7820	4	1	45	3	392
Kentucky	6	3	1005	3	2400	3	1	0	3	200
Alabama	39	15	17395	24	15020	12	1	284	11	2594
Michigan	.....	.....	.....	.....	.....	16	6	2594	10	4018
Tennessee	13	6	4597	7	38.0	9	1	314	8	2310
Georgia	2	0	0	2	960	3	1	275	2	360
North Carolina	2	0	0	2	60	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	1	70	10	975
Texas	.....	.....	.....	.....	.....	4	0	0	4	1000
Washington	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	366	136	157815	230	154889	98	18	5144	80	14820

SUMMARY.

Fuel.	In Blast. Number.	Month Previous.	Year Previous.	In Blast. Weekly Capacity.	Month Previous.	Year Previous.	Out of Blast. Number.	Month Previous.	Out of Blast. Weekly Capacity.	Month Previous.
Charcoal	18	19	21	5,144	5,456	5,085	80	79	14,820	14,800
Coke and Anthracite	136	135	194	157,815	154,264	192,375	230	230	154,889	157,442
Total	154	154	215	162,959	159,720	197,460	310	309	169,709	172,242

*The above table is condensed from the *Iron Age*. The tables of the *American Manufacturer* show in blast Feb. 1, 156 furnaces, with 168,687 tons weekly capacity instead of 162,959 as above.

The Philadelphia Engineering Co. in a few days will ship overland to San Francisco and thence to Japan an immense steel plate smokestack to equip a large new electric light plant in Yokohama. The stack is 175 feet high and 7 feet 3 inches in diameter in the clear, weighing over 90,000 pounds. The contract was awarded by S. N. Ishida, a Japanese engineer who is in this country representing the Yokohama company. Several Philadelphia firms have received contracts for the machinery equipment of the plant.

Preparations are being made at the works of the Maryland Steel Co., at Sparrow's Point, Md., for an early resumption of work. Large quantities of ore have been accumulated in recent months of idleness, blast furnaces are being put in shape and it is expected that operations will be resumed by March 1.

"WHERE IGNORANCE IS BLISS--"

Somebody is losing money and dosen't know it.

We attribute it to the fact that there are thousands of steam users who have never heard of the Cochrane Heaters, or, having heard of them, have not investigated them or compared them with those they do know. These Cochrane Heaters are better than the ordinary run—are better than the extra good—are better than any other appliance for a similar purpose that is sold on the market to-day, yesterday, or ten years ago. Perhaps we lack in modesty in saying this ourselves, as our customers have been and are saying it for us. But then until you happened to meet them you would be losing the advantage of a good thing—a very good thing—so we decided to pocket our pride and tell you direct. Not our word for it that these Cochrane Heaters can *thoroughly* free your exhaust steam from cylinder oil, (there are nearly a thousand of our oil separators you can refer to before you need fall back on us) that they can heat water about as hot as exhaust steam can make it, can give you "real purification," etc., and do all this without getting out of order. What do they cost? Oh! They're gilt-edged! Ask us, stating how much water you want to heat, how much exhaust steam you have and whether you want to heat your building or a dryer.

Nearly 12 years ago we commenced building these Cochrane Heaters.

HARRISON SAFETY BOILER WORKS,

PHILADELPHIA, PA.

LIFTING THE COPE.

A good "lift" is always of course a thing greatly to be desired. The same painstaking care should be observed in this as in all other parts of the process of making a mold. Of course we all know that the flask pins and plates ought always to fit nicely, but then we also know that a great many of them do not fit at all. It is next to impossible to keep all of the flasks in perfect order, and most molders frequently have to depend more upon their own good manipulation of the flask than upon the latter's good qualities. The guide pins of the snap flask are always adjustable and the molder therefore has no excuse for a loose fit.

But even in this case, where the adjustment is perfect, great care in lifting is often in the highest degree profitable. If the cope be suddenly lifted from a smooth surface of considerable area, the atmospheric pressure may cause a bad "lift." Exactly at the juncture of the sand with the smooth pattern the air is more nearly excluded than at any other point in the mold. Partly because the sand is harder compacted here than at any other point between this and the outer surface, and partly because of condensation of water caused by difference in temperature of the pattern and the sand. Therefore if you lift too quickly, a patch of sand is liable to "stick;" in other words, to be torn from the cope by internal atmospheric pressure. Whereas, if you lift very slowly the adhesive quality of the sand will overcome this force, and you will get a clean lift.

But it takes more than ordinary care to properly adjust the pins of a snap flask. Few molders will use a loose pin, but the number of those who always have the pins too tight, is legion. When the pins are too tight, the molder proceeds to lift the cope, but it sticks. Slowly he applies the force, increasing it by degrees till by and by up springs the cope like a new "jumping jack," and perhaps you get a good "lift," but if you do it's no credit to good management.

The pins of a snap flask should be perpendicular to the plane of the flask joint so as to guide the cope perfectly throughout their length; and the adjustment should be so nice as to cause but the merest trifle of friction. It will pay many times over for all the care taken. In lifting medium and large copes, where the shape of the pattern will permit, it is best to lift one end at a time, till it is well started, and this for two reasons: 1. The atmospheric pressure is thus reduced to the minimum. 2. If the cope rest solidly at one end while the opposite end is being lifted there is scarcely any danger of its swaying sidewise, thus knocking off from the cope masses of sand. Finally, the lifting of the cope is one of the operations in molding that ought always to be done slowly and carefully.—[E. H. Collins, in Chattanooga Tradesman.

It is reported that the Buhl Steel Co. will build a blast furnace at Sharon, Pa. The new basic steel plant now building will require more iron than the furnace now going can furnish, apart from what it makes for the Buhl mill.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Excelsior Foundry Co. has been incorporated at Peoria, Ill., with a capital stock of $5,000, by John F. O'Brien, John W. Culbertson and George W. Brasley.

The New Castle, Pa., Water Co. will erect a new pumping station at once and also commence the building of a new reservoir.

The Gardner-Champlin Co. has been incorporated at Chicago, with a capital stock of $10,000, to manufacture machinery, by Henry A. Gardner, Joseph Cummins and Hugo Pam.

F. W. Krause, 44 S. Jefferson street, Chicago, wants to buy a 36-inch bandsaw, shaper, heavy bandsaw, automatic knife grinder, invisible sander and 200 h. p. compound engine.

The E. H. Stafford Co., Muskegon, Mich., is in the market for a heater, 100 h. p. boiler and automatic steam pump.

R. E. Fitzgerald, 617 Austin avenue, Chicago, is in the market for an engine and two boilers of 80 h. p. each.

"Engine," 1502 Monadnock, Chicago, wants to buy a second-hand engine, 150 h. p., and gears and housings suitable for a mill train of three rolls high.

The city of Newberry, S. C., will receive bids until March 8 for erection and equipment of a water works and electric light plant. Dr. James McIntosh can be addressed at Newberry, S. C.

Ligonier, Pa., decided at a special election held Feb. 15 to commence in April the erection of water works.

N. B. Higbie, 89 Lake street, Chicago, wants to buy three second-hand 36-inch by 8 foot planers.

The Robinson-Wiggs Foundry & Machine Co. has been incorporated at Birmingham, Ala., by W. G. Robinson, J. A. Wiggs, Jr., and others. The capital stock is $10,000.

Thomas H. Eastwoord, McMinnville, Tenn., will rebuild at once his foundry and machine shops recently burned. He will buy a planer, reamer and drill press.

Walsh & Weidner, Chattanooga, Tenn., are receiving estimates on a 50-foot, 5 to 10-ton traveling crane, 16-foot bending rolls, flange punch and shears and emery grinders.

New Construction:—

The Pittsburg Bridge Co. is now erecting two steel bridges on the main line of the B. & O. Railway. This company just shipped material for a new building to be erected by the J. B. Clow Co., at Newcomerstown, O., and another for the Philadelphia Smelting & Refining Co., of Denver, Colo. A contract for the Princeton Stack Building, requiring some 165 tons of material, has recently been taken. The plant is running double turn with considerable work ahead.

Contracts for the construction of an Odd Fellows' building at Attleboro, Mass., have been let by the architect, Albert H. Humes, of Pawtucket, R. I. The building will be five stories

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ‡ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv County, Md.

Branch Offices:—No. 1 Broadway, New York. N. Y.: No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

DUCTILE CAST IRON

TENSILE STRENGTH 60,000 LBS.

HOMOGENEOUS, SOLID AND CLEAN.

HIGH ELECTRICAL PERMEABILITY.

EAST CHICAGO FOUNDRY CO., 716 THE ROOKERY, CHICAGO.

Subscribe for the Iron Trade Review, $3 per year.

EDWARD E. ERIKSON,

CONSULTING AND CONTRACTING ENGINEER.

Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.

Automatic Bi let Heating Furnaces. Plans and estimates furnished.

CONESTOGA BLDG., PITTSBURG PA.

Stowe, Fuller & Co.

WESTERN AGENTS OF

Mount Savage and Queen's Run Fire Brick

The leading BRICK of this country.

MANUFACTURERS OF

OHIO FIRE BRICK. ALL SHAPES IN STOCK.

The largest shippers of FIRE BRICK in the West.

Warehouse and Docks: 185-193 Merwin Street

CLEVELAND, OHIO.

high and about 70 feet square. The interior construction supporting the floors will be steel girders resting on steel columns. The contract for furnishing and erecting the steel work has been let to the Berlin Iron Bridge Co., of East Berlin, Conn.

The King, Gilbert & Warner Co., Columbus, O., has decided to erect a new blast furnace in Columbus. The furnace will be 80 feet high, with 18 foot bosh, equipped with Massick & Crooks stoves 19½ x 75 feet high. The furnace will be modern in every particular with capacity exceeding 300 tons daily. Most of the contracts for the iron work and machinery have already been placed. The foundations are being put in and the work will be pushed to completion. It will be called the Steelton Furnace and will be erected on the company's land, adjoining its Bessemer steel plant.

Additions, Enlargements, Removals, Etc.:—

The locomotive works and carshops of the West Shore Railroad will be moved from Frankfort, near Utica, and consolidated with the New York Central carshops at Depew, near Buffalo, May 1. The transfer will take place two months later than was anticipated. The estimated saving to the Vanderbilt system by consolidating its shops is $200,000 per annum.

The Enterprise Boiler Co., Youngstown, which several nearby towns have endeavored to secure, will not remove from Youngstown, but has purchased land adjoining its present plant for the addition necessitated by increasing business.

A wire nail department is being added to the plant of the Thomas Brass & Iron Co., Waukegan, Ill. When completed it will have, it is reported, an average capacity of 200 kegs of nails per day.

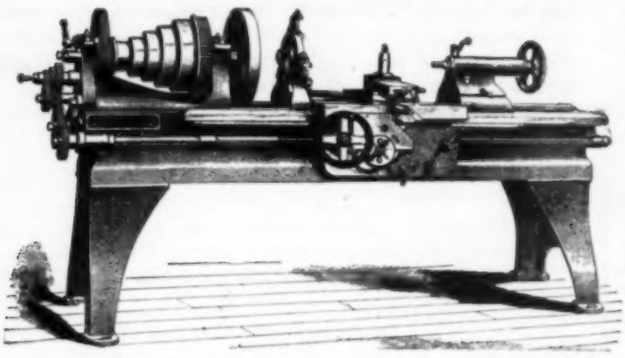
The Pennsylvania Bolt & Nut Co., Lebanon, Pa., manufacturer of refined iron and bolts and nuts, has commenced work on the erection of a large addition to its plant.

General Industrial Notes:—

Wm. Tod & Co., of Youngstown, O., have recently sold a 38 x 36-inch blooming mill engine to the Burgess Iron & Steel Co., Portsmouth, O., for the blooming mill it is erecting, and a 22 x 27-inch Porter-Hamilton automatic engine to replace an old mill engine in the plant of William Clark's Son & Co., this city. A 34 x 36-inch Hamilton vertical engine is being built

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.



MACHINE TOOLS

...AND...

Machinist's Supplies.

LATHES,
PLANERS,
DRILL PRESSES,
MILLING MACHINES,
SCREW MACHINES,
PIPE MACHINES,
BOLT CUTTERS,
BOLT HEADERS,
STEAM HAMMERS,
POWER HAMMERS,
SHAPERS,
GEAR CUTTERS.
KEY SEATERS,
HARRINGTON HOISTS.

Send for List of Second-Hand Tools.

ATWOOD & M'CAFFREY,

Brass Founders, Iron Pipe Fitters and Machinists,

MANUFACTURERS OF AND DEALERS IN

All Kinds of Pipe, Globe and Gate Valves, Fittings and Appliances for Steam, Gas, Water and Hydraulic Work.

Phosphor Bronze ("Elephant Brand") Castings, Coolers, Tuyeres and Cinder Notches for Blast Furnaces supplied promptly.

Rolling Mills, Steel Works, Blast Furnaces Coal and Coke Works, Power Houses for Electric Street Railways, etc., promptly fitted up by Experienced Workmen.

AIKEN Duplex and CRITCHLOW Valves, either three or four way, for operating Mill and Hydraulic Machinery of all kinds under any desired pressure, and Stop Valves for same.

Agents for the CAMERON STEAM PUMP, which is made in every possible variety, and suitable for all purposes to which Steam Pumps can be applied.

Nos. 108 to 118 Third Avenue. PITTSBURGH, PA.

to drive a roughing and finishing train in the plant of the Republic Iron Works, Pittsburg, and another engine of the same class, 38 x 32 inches, to drive two stands of rolls in the National Rolling Mill of the National Tube Works Co., McKeesport. The company also has an order for a blowing engine for Moxahala Furnace, Moxahala, O., and for two reversing engines for a Southern company.

Thomas Carlin's Sons, of Allegheny, Pa., have dismantled the open-hearth department of the Roane Iron Works, at Chattanooga, Tenn. The trains of rolls are still in the buildings, parts of which are now standing.

Riter & Conley, of Pittsburg, have received a contract from the Columbus (O.) Gas Co. to construct a steel gas holder, having a capacity of 1,700,000 cubic feet. It will be the largest of its kind, with one excieption, west of the Allegheny Mountains. The tank will require 2,100,000 pounds of steel.

The Newport (Ky.) Rolling Mill has resumed operations, giving employment to 400 men.

Judge Peyton R. Harrison has been appointed general receiver for the Auburn wagon works at Martinsburg, W. Va. The liabilities are $120,000 and the assets $65,000. T. C. Ward & Co. were managers of the works. The plant was subsidized and removed from Greencastle, Pa., by the Improvement Building & Loan Association of Parkersburg, W. Va.

In connection with the McKenna project for re-rolling rails and the establishment of a plant to work the process at Joliet, Ill., it is stated that relaying rails are not likely to be salable now that new rails are so cheap. This would indicate that railroads would prefer to re-roll their rails which they can not sell.

Charles F. Wells, receiver of the Linden Steel Co., Pittsburg, filed an answer last week to the rule of the court ordering him to show cause why he should not pay interest on a mortgage for $93,000. In his reply the receiver states that by a previous order of the court he was authorized to issue receiver's certificates to the amount of $70,000. Of this amount $65,000 has been issued and there is on hand only $45,709, which he has declined to pay out on the ground that it might embarrass the operation of the works. The first mortgage creditors have recently moved for the sale of the property and this action has been concurred in thus far by most of the holders of second mortgage bonds.

The Bradford Mill Co., of Cincinnati, O., has taken several orders for foreign shipment of its engine lathes. Among these orders is one for 45 lathes to Stockholm, Sweden; one for 100 lathes for Berlin, Germany, and one for two lathes for the Exposition Building, at Brussels. Several orders from home concerns are also reported.

At the Bessemer plant of the Cambria Iron Co., Johnstown, Pa., 166 heats were made on Feb. 21, averaging 12 tons. The previous record was 154 heats.

The switch works of the Johnson Co., Johnstown, Pa., which closed down Feb. 13, resumed on the 24th inst. and a large force of men went to work.

The plant of the Ohio Tube Co., Warren, O., manufacturers of wrought iron and steel pipe, which has been idle for some little time, was started up Feb. 15. The company has secured sufficient orders to run for some time.

It is reported that both furnaces and the steel plant of the Watts Steel & Iron Co., of Middlesborough, Ky., will be put in full operation about April 1.

The Barnum & Richardson Co., of Lime Rock, Conn., has recently made a contract to furnish the New York, New Haven & Hartford Railroad with all the car wheels it may require for the entire system for the year 1897. It will probably be necessary to enlarge the works at Lime Rock.

The Tyler Tube & Pipe Co., Washington, Pa., manufacturer of charcoal iron boiler tubes, has received an $18,000 order for the tubes to be used in the Japanese war ship now being built by the William Cramp Ship & Engine Building Co., of Philadelphia.

Geo. T. Barnes & Co. have removed to their new offices at No. 14 South Broad street, Philadelphia.

A. M. Byers, of Pittsburg, and the Girard Iron Co., operating the Girard (O.) Furnace, are defendants in a lawsuit

brought by W. J. Rainey, of Cleveland. The plaintiff's petition claims that he sold coke under contract to the Girard furnace. The sums for which he asks payment are: $677.40, with interest from April 1, 1889; $3,242.50, with interest from April 25, 1891, and $682.68, with interest from May 25, 1891.

The S. R. Smythe Co., of Pittsburg, has taken the contract for two 50-ton basic open-hearth furnaces to be built at once by the Birmingham Rolling Mill Co., of Birmingham, Ala.

The Warren, O., mill of the Union Iron & Steel Co., Youngstown, O., is about to start up after a long idleness. At its continuous mill at Youngstown, the company has started again on the manufacture of cotton ties.

The Youngstown (O.) Bridge Co. and the Youngstown Car Mfg. Co. are figuring on 100 cars for the Carnegie Steel Co., each to be of 100 tons capacity and almost entirely of steel.

At the Vulcan Iron Works, Tamaqua, Pa., molders will work 10 hours a day instead of eight, as heretofore. Orders for three large engines for coal companies have been received.

Twenty-inch I beams are being rolled at the Phœnix Iron Co.'s mills at Duncannon, Pa.

The Cornwall ore banks, near Lebanon, Pa., are being worked at a lively rate, over 2,000 tons per week being shipped to the Scranton works of the Lackawanna Iron & Steel Co.

The rod mill of the Consolidated Steel & Wire Co.'s plant at Beaver Falls claims to have broken the record for a 10-hour run on No. 5 rods making 390,000 pounds of finished rods.

The Eleanor Iron Works, Hollidaysburg, Pa., started up this week, after a several months' shut down. The puddlers accepted a wage reduction to $2.75 a ton.

EXCURSIONS TO MEXICO

Via Pennsylvania Lines, January 19th and February 27th.

Under escort of American Tourist Association, Reau Campbell, General Manager. Sleeping and dining cars and special baggage cars through all the tour without change. More miles and days in Mexico, more cities and towns than ever offered. Tickets include all expenses, sleeping and dining cars, hotels, etc. For information, apply to F. Van Dusen, Chief Assistant General Passenger Agent, Pennsylvania Lines, Pittsburg, Pa.

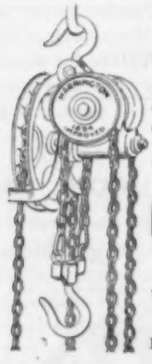
AT Cleveland, the big steel steamer Andrew Carnegie, building at the yard of the Cleveland Shipbuilding Co. for the Wilson Transit Co., was successfully launched Feb. 20. The Carnegie will be completed by the opening of navigation, and will be one of the largest carriers on the lakes.

To Washington, D. C.,

For the Inauguration, go via the C. T. & V. R. R., in connection with the picturesque B. & O. daylight trip over the mountains, or through sleepers on night trains. Only $11 round trip. Tickets good going March 1st, 2d and 3d. Limited to the 8th for return. See your C. T. & V. agent for particulars.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*



IF YOU HAVE

A WEIGHT TO LIFT,

Get a Good Hoist.
Get the Best Hoist.
Get the Harrington Hoist.

Made Only in Philadelphia.

EDWIN HARRINGTON SON & CO., Inc.,

1526 Penna. Ave., PHILA., PA.

MANUFACTURERS

Improved Machine Tools.

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

Hoisting, Crushing and Mining Machinery.

EARLE C. BACON.

ENGINEER,
Havemeyer Building, New York.

WORKS.

Farrel Foundry & Machine Co. and Pacific Iron Works.

BACON'S HOISTING ENGINES

For Every Possible Duty.

MINE CARS, SKIPS and MINE EQUIPMENT.

"FARREL'S" (Blake Pattern) ORE AND ROCK CRUSHERS

AND

HIGH SPEED OR GEARED CRUSHING ROLLS

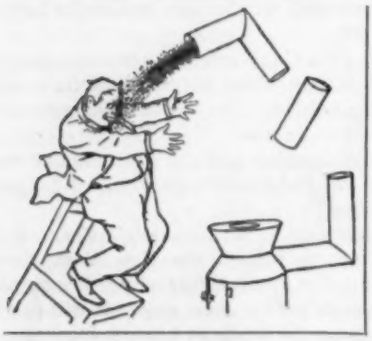
COMPLETE HOISTING, CRUSHING AND MINING PLANTS OUR SPECIALTY FOR OVER 20 YEARS, AND IN USE IN ALL PARTS OF THE WORLD.

Send for our Completely Illustrated Catalogues.

We Claim The Following Merits for Jenkins Bros.' Valves

1. Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
6. ALL GENUINE stamped with Trade Mark. (2)

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.



REFRACTORY. That's what's the matter with that stove pipe; it's refractory! So is our **CUPOLA BLOCK**, but in another way (see Webster's definition.) We are not talking about a Block made from any kind of Clay, but about our

Colliau Cupola Block

which is strong enough to resist all friction, and refractory enough to withstand the heat at time of melting. It is made from Kentucky Clay and is all right. Another thing: Our **Stamped Steel Hand Ladle** weighs but 3 lbs. and is another up-to-date production. We have "**Everything for a Foundry.**"

F. B. STEVENS,

90 Griswold Street, 11-13 Atwater Street, W., - DETROIT, MICH.

LOCATIONS FOR INDUSTRIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y.
425 Old Colony Bldg., CHICAGO, ILL.

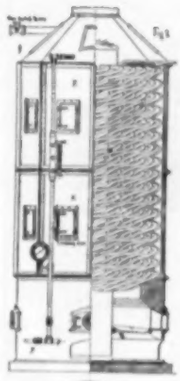
S. FIX SONS'
STEAM TUBE WELDING WORKS.

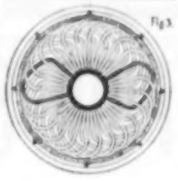
Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

CLEVELAND, O.

The Iron Trade Review has a rapidly growing constituency in the great Central Zone, the best buying section in the country, as machinery manufacturers and establishments devoted to power equipment have found out in the past three years. Between the Alleghenies and the Mississippi are located many of the most prosperous industries in the country, and they have been buyers when there was only limited business in other sections. Advertisers are coming to recognize this fact, as the growing patronage of the columns of this paper gives abundant testimony.

THE CLONBROCK STEAM BOILER CO.,
BROOKLYN, N. Y.





MANUFACTURERS OF

THE MORRIN "CLIMAX" AND "COMPOUND"

WATER TUBE BOILERS

No Screw Joints. No Metallic Joints. No Ground Joints. No Packing Joints. No Cast Iron Pipes. Manifolds or Headers to cause trouble from Unequal Expansion or Contraction.

Quick and Steady Steamers,
Positive Circulation.

THE "CLIMAX" IS BUILT IN UNITS OF 50 TO 1,000 H. P
THE "COMPOUND" IS BUILT IN UNITS OF 50 TO 500 H. P.

☞ **Caution: Beware of Infringers, they will be rigidly prosecuted.**

Specifications, Blue Prints, Etc., Furnished on Application.

SEND FOR "CLIMAX" and "COMPOUND" CATALOGUE

CLEVELAND
.. GALVANIZING ..
WORKS.

Galvanizing in all its branches. Highest prices paid for new Scrap Zinc. When in the market for Pump Chains and Rubber Buckets write us for prices.

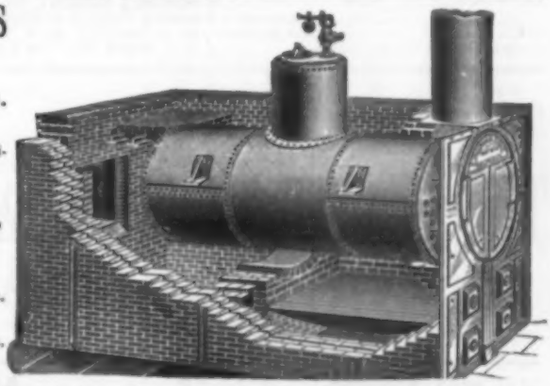
CLEVELAND, OHIO.

DONT BUY ROOFING & SIDING TILL YOU HAVE SEEN OURS
THE BERGER MF'G. CO.
CANTON, OHIO

S. FREEMAN & SONS
MFG. CO.,
11 Bridge St., RACINE, WIS.
MANUFACTURERS OF
Standard Tubular, Fire Box, Vertical and Submerged Tube Steel

BOILERS.

For Stationary, Portable, or Marine use.
Also of **TANKS** of all kinds, Smokestacks, etc.,
Grey Iron Castings.
Write for Prices and Terms.



Being in the boiler business
For a long time,
We have learned that **HEATING SURFACE** does not always mean **HORSE POWER;**

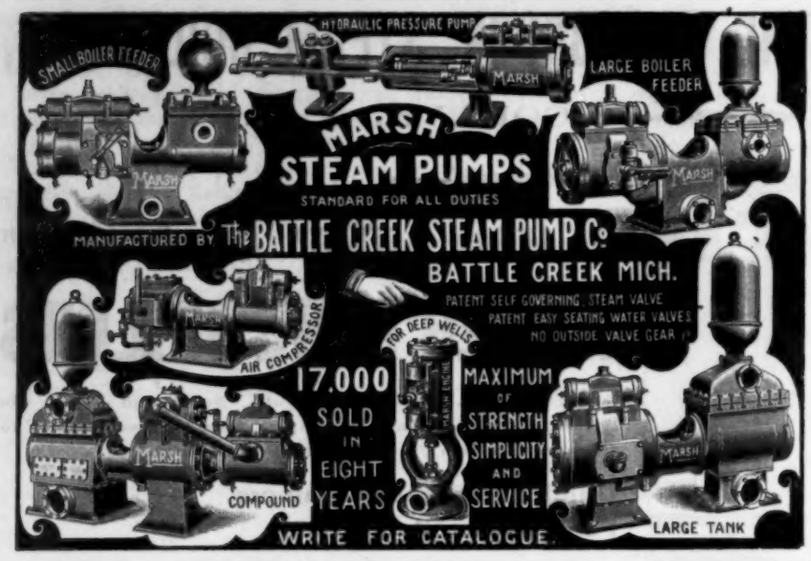
It depends upon getting the HEAT to the SURFACE.

We have also learned that the only way to make a HIGH GRADE article, and sell it for about the same price as an ordinary one, is to concentrate our WHOLE PLANT and ENERGIES upon ONE ARTICLE—

THE TUBULAR STEAM BOILER.

Write us for Prices and Specifications. You need not unload the goods off the car if not as represented.

FULTON STEAM BOILER WKS. & FDY.
Richmond, Ind.



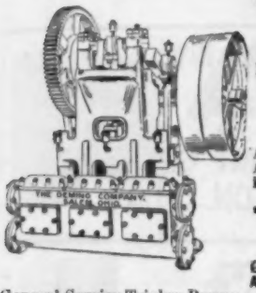
WORTHINGTON STEAM PUMPS

HENRY R. WORTHINGTON,

NEW YORK.

Boston. Philadelphia. Chicago. Cleveland. St. Louis. Indianapolis. Detroit. Atlanta. Pittsburg.

SEND FOR CATALOGUE.



General Service Triplex Pumps.

TRIPLEX PUMPS

Four Types and Eight Sizes for ELECTRIC AND OTHER POWER.
SINGLE AND DOUBLE-ACTING CYLINDERS.

Unequaled in Design and Construction.

Adapted for Water Works, Hydraulic Elevators, Boiler Feeding, Apartment Houses, Mine Pumping, Irrigation, Paper Mills, Refineries, Breweries, Etc.

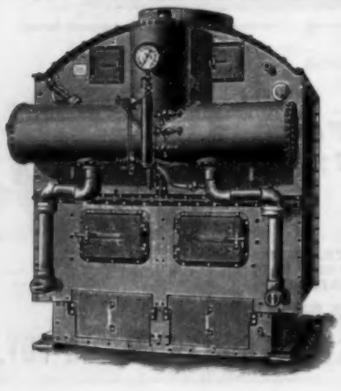
MADE BY

THE DEMING CO., SALEM, O.

General Agencies: HENION & HUBBELL, 61-69 N. Jefferson St., Chicago. HARRIS PUMP & SUPPLY CO., 320-322 2nd Ave., Pittsburg. W. P. DALLETT, 49 N. 7th St., Philadelphia. C. J. JAGER CO., 174 High St, Boston.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**



. . . ALMY'S . . .

PATENT SECTIONAL WATER TUBE BOILERS

FOR

Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats, Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

This Boiler possesses more advantages than any other Boiler.

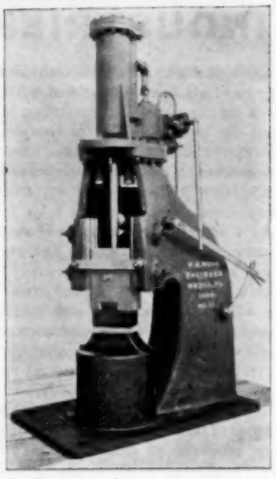
It has STOOD THE TEST of over seven years' constant daily use in passenger steamers, and is in use in many of the best steam yachts. It has proved its durability to be equalled by none. It has shown from 10 to 15 per cent saving in every day work over the best Marine Fire-Tube Boiler.

It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive. No priming, and easy to manage.

ALMY WATER TUBE BOILER CO.,

178-184 Allen's Ave., near Rhodes St., PROVIDENCE, R. I.

STEAM HAMMERS



PATENTED HYDRAULIC MACHINERY. Riveting Machines, Flanging Presses, Punching, Shearing and Forming Machines.

Accumulators, Cranes, Pumps, Etc.

WM. H. WOOD, ENGINEER, MEDIA, PA

Builder of Special Machinery.

The Iron Trade Review has a rapidly growing constituency in the great Central Zone, the best buying section in the country, as machinery manufacturers and establishments devoted to power equipment have found out in the past three years. Between the Alleghenies and the Mississippi are located many of the most prosperous industries in the country, and they have been buyers when there was only limited business in other sections. Advertisers are coming to recognize this fact, as the growing patronage of the columns of this paper gives abundant testimony.

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: Steel and Iron Buildings for Rolling Mills, Tin Plate Plants, Steel Works, Foundries, Factories, Roof Trusses, Girders, Columns, Beams, Corrugated Iron, Etc.

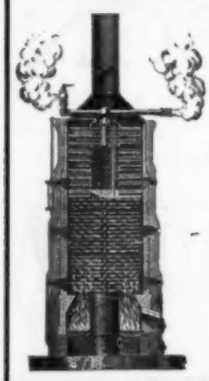
Main Office and Works:

48th Street and A. V. Ry., PITTSBURG, PA

Branch Offices:

1123 Betz Building, Philadelphia, Pa.
45 Broadway, New York, N. Y.
228 Lumber Exchange, Minneapolis, Minn.
1243 Marquette Building, Chicago, Ill.

The Great Coal Saver and Producer of Dry Steam.



THE HAZELTON OR PORCUPINE BOILER.

THE PIONEER VERTICAL WATER-TUBE BOILER
. . OF THE WORLD. . .

16 Years' Unequalled Record for Economy, Safety and Durability.

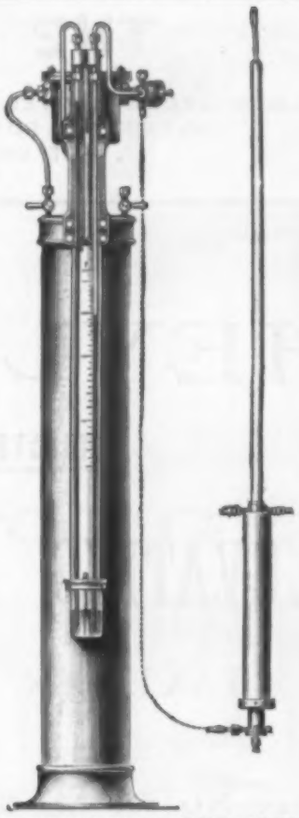
No Explosions or Accidents of Any Kind.

CORRESPONDENCE SOLICITED.

THE HAZELTON BOILER CO.,

SOLE PROPRIETORS AND MANUFACTURERS,

Telephone 1229, 18th St. N. Y. GENERAL OFFICE:
Cable Address, "Palia," N. Y 716 East 13th St., NEW YORK, U. S. A.



THE PNEUMATIC PYROMETER.

Stationary and Portable.

SENSITIVE, ACCURATE AND DURABLE TO

3,000 DEGREES.

Uehling, Steinbart & Co., Ltd.

64 Mulberry Street,

NEWARK, N. J.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year $3.00.

A growing circulation among machine shop and foundry firms, has

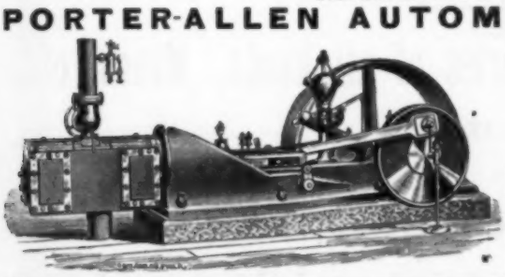
THE IRON TRADE REVIEW.

SOUTHWARK FOUNDRY & MACHINE CO.

PHILADELPHIA, PA.,

SOLE MAKERS OF THE

PORTER-ALLEN AUTOMATIC ENGINE.



FEATURES OF THIS ENGINE

Simplicity of Design,
Highest Economy of Steam,
Close Regulation of Speed,
Minimum Floor Space.

ALSO BUILDERS OF

Blowing and Reversing Engines,
Water Works Pumping Engines,
Centrifugal Pumps and Weiss
Counter-Current Condensers.

WESTINGHOUSE, CHURCH, KERR & CO.

ENGINEERS.

STEAM ENGINES. STEAM LOOPS.

COMPLETE STEAM PLANTS. COMPLETE ELECTRICAL PLANTS.

REFRIGERATING MACHINERY.

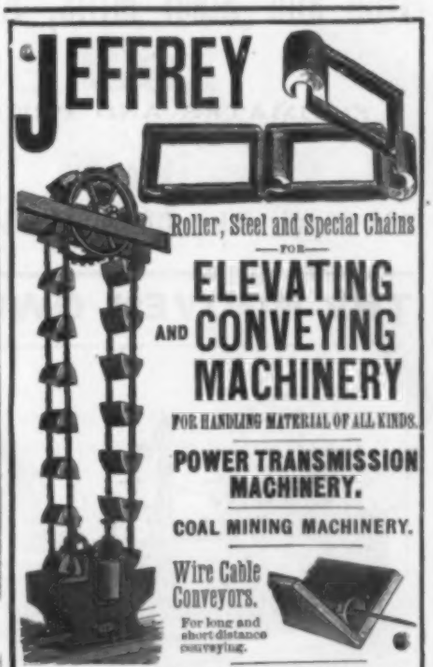
COMPLETE ICE PLANTS.

MECHANICAL STOKERS. MECHANICAL DRAFT.

COMPLETE BOILER PLANTS. COMPLETE ECONOMIZER PLANTS.

NEW YORK	BOSTON.	PITTSBURG.	CHICAGO.
26 Cortlandt Street.	53 State Street.	Westinghouse Bldg.	171 La Salle Street.

JEFFREY



Roller, Steel and Special Chains

—FOR—

ELEVATING AND CONVEYING MACHINERY

FOR HANDLING MATERIAL OF ALL KINDS.

POWER TRANSMISSION MACHINERY.

COAL MINING MACHINERY.

Wire Cable Conveyors.

For long and short distance conveying.

THE JEFFREY MFG. CO. Columbus, Ohio.

163 Washington St. NEW YORK.

Send for Catalogue.

THE BUCYRUS COMPANY,

DESIGNERS AND BUILDERS OF

DREDGES, STEAM SHOVELS, EXCAVATING MACHINERY,
CENTRIFUGAL PUMPS, WITH SIMPLE, COMPOUND OR TRIPLE EXPANSION ENGINES,
PILE DRIVERS, WRECKING CARS, LOCOMOTIVE CRANES,
PLACER MINING MACHINERY. SOUTH MILWAUKEE, WISCONSIN.

.....ESTABLISHED 1887.....

HEYL & PATTERSON

ENGINEERS AND CONTRACTORS.

ELEVATING AND CONVEYING MACHINERY,

LABOR SAVING APPLIANCES.

COMPLETE INSTALLATIONS.

Office No. 108 Market St., -:- PITTSBURG, PA

LONG DISTANCE TELEPHONE 746.

GENERAL ELECTRIC COMPANY

Electrical Apparatus

FOR THE ECONOMICAL OPERATION OF

Iron and Steel Mills, Engine Shops, Factories of all kinds, Mines, etc.

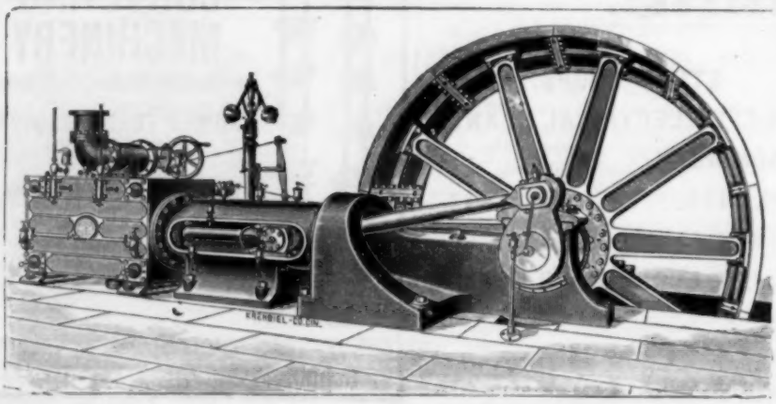
WATER-POWERS UTILIZED.

ESTIMATES AND PRICES ON APPLICATION.

Main Office, SCHENECTADY, N. Y.

Sales Offices in all large Cities in United States. Foreign Department, 44 Broad Street, New York.

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.

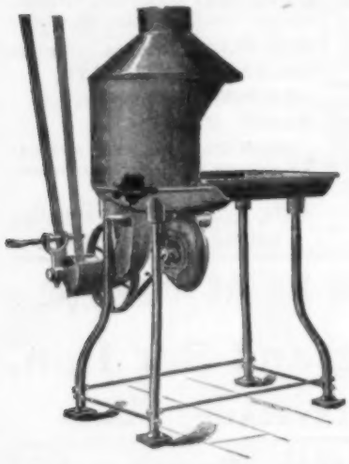


Hamilton Corliss Engines.

Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all Sizes and for all purposes.

46 South Canal St., CHICAGO.
39 and 41 Cortlandt St., NEW YORK.
Lewis Block, PITTSBURGH, PA.
Room A, Laclede Building, ST. LOUIS, MO.
C. C. MOORE & CO., SAN FRANCISCO, CAL.

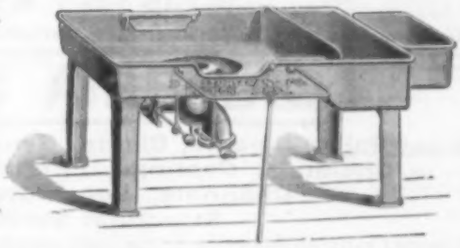


STURTEVANT FORGES

40 SIZES and STYLES.

PRICES REDUCED.

Send for Catalogue No. 91.



B. F. STURTEVANT COMPANY,

34 Oliver St., Boston, Mass.
131 Liberty St., New York, N. Y.
16 South Canal St., Chicago, Ill.
135 North Third St., Philadelphia, Pa.

75 Queen Victoria St., London, E. C., England.
21 W. Nile St., Glasgow, Scotland.
87 Zimmerstrasse, Berlin, Germany.
2 Kungsholmstorg, Stockholm, Sweden.

The

Kellogg Weldless Tube Co.,

Findlay, O.

MANUFACTURERS OF

Seamless Steel Tubes,

For Hydraulic Tubes, Jacks, Presses and Hoists, Lathe Spindles, Bicycle Hub Stock Projectiles, Hollow Shafting, Shells for Carbonic Acid and other Gases, Piston and Valve Rods, Axles, Bolts and Columns, Working Barrels, Roller Bearings, Bushings, Couplings, Boiler Tubes and other purposes where

Strength, Uniformity and Durability

ARE REQUIRED.

Our tubes are hot drawn, without weld or seam; from the best quality of steel, in lengths from 8 to 25 feet, and of any degree of hardness, from .08 to .60 carbon —They are equal in every respect, except finish, to cold drawn tubes and are offered at a much lower price.

For special work, requiring extremely low sulphur and phosphorus, we are prepared to guarantee a maximum of

.020 SULPHUR and .015 PHOSPHORUS.

The following Sales Agencies will be pleased to supply any additional information that may be desired, viz:

Kellogg Weldless Tube Co.,
45 Milk Street, Boston.
Wm. J. Haines & Co.,
906 Filbert Street, Philadelphia.
Henry L. Coe,
727 Garfield Bldg., Cleveland.

Kellogg Weldless Tube Co.,
New York City.
M. T. Miles & Son,
317 and 318 Western Union Bldg., Chicago.
C. R. Talbot & Co.,
9 and 10 Wiggins Blk., Cincinnati.

Soft Steel Bars, Light

LOW PRICES

do not always influence business. Some brands of goods are undesirable as a **Gift.**

Write us for our catalogue and send us a sample order and see if there is not **Economy** in using **First Quality** goods at Fair Prices.

Structural Shapes, Rails.

TIN PLATES,
GALVANIZED SHEETS,
CORRUGATED IRON,
BLACK PLATES,

Sheet Iron and Steel, any finish, patent leveled or common.

Aetna Standard Iron & Steel Co.,
BRIDGEPORT, OHIO.

'97 IS YET NEW, SO BEGIN THE YEAR RIGHT

—BY USING—

CLINTON AND HECTOR

Inspected Foundry Irons

—FOR—

SOFTNESS, STRENGTH, FLUIDITY, UNIFORMITY.

Quality has given it a high position in the trade, it is no experiment, try it.

MANUFACTURED BY

CLINTON IRON & STEEL CO.,

New York Office: No. 15 Cortlandt St. Furnaces: Pittsburgh, Pa.

CAMBRIA STEEL.

Steel Rails, Blooms, Billets, Beams, Bars, Axles, Angles, Channels, Castings, Forgings, Zee Bars, Car-Channels, Locomotive, Car and Structural Steels, etc.

CAMBRIA IRON COMPANY, S. W. Cor. 15th and Market Sts., opp. Penna. R. R. Station, Philadelphia; Chicago office, Western Union Building; New York office, (for Rails and Axles), 33 Wall St.; Cleveland office, Bourne, Fuller & Co; Detroit office, Newberry Bldg.; Toledo office, The Nasby, No. 401; Cincinnati office, cor. Elm and Pearl Sts. Works at Johnstown, Pa.

GAUTIER STEEL DEPARTMENT OF CAMBRIA IRON CO.,
JOHNSTOWN, PA.

MERCHANT BAR STEEL: Including Tire, Toe Calk, Machinery, Carriage Spring, Railroad Spring, Hoe, Rake, Fork, etc.

AGRICULTURAL STEEL AND SHAPES: Finger Bars, Knife Backs, Rake Teeth, Bundle Carrier Teeth, Tedder Forks and Springs, Spring Harrow Teeth, Harrow (Drag) Teeth, Seat Springs, etc.

PLOW STEEL: Flat and Finished Plow Shapes, Digger Blades, Slabs (Penn and Pernot), Hammered Lay, Rolled Lay, etc.

Cold Rolled Steel Shafting. **Steel Harrow Discs.** **Cambria Link Barb Wire.**

New York Office, 102 Chambers St.	Philadelphia Office, 611 Phila. Bourse.	Chicago Office, 209 Western Union Bldg.	Atlanta Office, 325 Decatur st.

CLEVELAND ROLLING MILL CO.,

CLEVELAND, - OHIO,

—MANUFACTURERS OF—

BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Ba Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00 677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00 494		

Foundry Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

---

LAKE SUPERIOR CONSOLIDATED IRON MINES

HIGH GRADE MISSABE BESSEMER ORES.

From the **ADAMS MINE,** for sale by **TOD, STAMBAUGH & CO., Agts., Cleveland, O.**
From the **BURT, HULL and RUST MINES,** for sale by **OGLEBAY, NORTON & CO., Agts., Cleveland, O.**

THE BOURNE-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,
LAKE SUPERIOR IRON ORES.

— AGENTS —

The Spanish-American Iron Co.,
Santiago, Cuba.

CLEVELAND. PHILADELPHIA.

M. A. HANNA & CO.

IRON ORE,

PIG IRON AND COAL.

CLEVELAND, OHIO.

F. A. BATES, M. M. DRAKE, J. H. BARTOW.
Buffalo.

DRAKE, BATES & CO.

IRON ORES.

Mines:

CINCINNATI, ROBERTS, } Bessemer.

HALE,—Non-Bessemer.

Wade Building, CLEVELAND, O.

J. WESLEY PULLMAN

No. 238 South Third St., PHILADELPHIA.

Lake Superior Ores. Warwick Pig Iron.

NEW JERSEY AND NEW YORK

MAGNETIC ORES

TILDEN IRON MINING COMPANY,
ASHLAND IRON MINING COMPANY,
AURORA IRON MINING COMPANY,

Iron mines at Bessemer and Ironwood, Gogebic County, Michigan.

CHARLES F. RAND, President,
No. 1 Broadway, NEW YORK, U. S. A.

Spanish-American Iron Company,

Iron Mines near Santiago de Cuba, Island of Cuba.

Annual Capacity 300,000 tons.

Iron Ores for export to all countries.

Cable Address, "Daiquiri," New York.	CHARLES F. RAND, President, No. 1 Broadway, New York, U. S. A.

JESSOP'S STEEL —FOR— **Tools, Drills, Dies, etc.**

Established over a Century ago. Manufactory, SHEFFIELD, ENGLAND.

CHIEF AMERICAN OFFICE, 91 JOHN ST., NEW YORK.

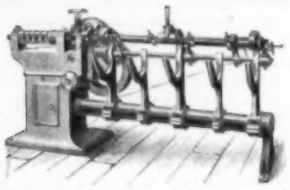
WM. JESSOP & SONS, Limited.

"Medal—World's Columbian Exposition, 1893."

All sizes carried in stock by The W. Bingham Co., Cleveland, Ohio.

By the use of this machine, wire is straightened and

CUT AT THE RATE OF 60 TO 190 FEET PER MINUTE,



Automatic Wire-Straightening and Cutting Machine.

direct from the coil, from one (1) inch up to any desired length. Prices range from $135.00 up. Write for catalogue, information, etc., sending samples of wire used.

JOHN ADT & SON,

F. B. Shuster, Prop.

NEW HAVEN, CONN.

BUILDERS OF

Roll and Rotary Wire-Straighteners, Automatic Wire-Straightening and Cutting Machinery, Riveting Machines, Special Automatic Machinery, Etc

---

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME. * Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R. Co

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.

ARE YOU LOOKING

FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee Mississippi and Louisiana, and possess

FINE SITES FOR NEW MILLS,

BEST OF FREIGHT FACILITIES,

CLOSE PROXIMITY TO

COAL FIELDS AND DISTRIBUTING CENTERS

AND

INTELLIGENT HELP OF ALL KINDS,

MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

100 Cities and Towns WANTING INDUSTRIES

This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

To sound industries, which will bear investigation, substantial inducements will be given by many of the places on the lines of the Illinois Central R. R., which is the only road under one management running through from the North. Western States to the Gulf of Mexico. GEO. C. POWER, Industrial Commissioner I. C. R. R. Co., 506 Central Station, Chicago. I-2-'94

The A B C of Iron

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

FORMER PRICE $2.00

NOW -:- $1.00.

ORDER OF

THE IRON TRADE REVIEW CO.,

27 Vincent St., CLEVELAND.

THE NEWPORT SAND BANK CO.,

INCORPORATED.

NEWPORT, KY.

SHIPPERS OF STANDARD MOLDING SAND AND FIRE CLAY.

Adapted to Castings of Any Nature.

Location of banks: Newport and Covington, Ky., Delhi and Hamilton, O., and Jeffersonville and Connersville, Ind.

All Sand Fully Guaranteed.

SECOND-HAND NUT AND BOLT MACHINERY.

FOR SALE AT A BARGAIN.

2 Nat. Improved Lewis Bolt Headers, list each $800. Our price each $450.
1 Nat. Hot Pressed Nut Machine (Class A), list $1200. Our price $800.
3 Nat. Double Rapid Bolt Cutters, to 1 inch, list each $425. Our price each $200.
1 Nat. Double Rapid Bolt Cutter, to ¾ inch, list $310. Our price $160.
1 Nat. Single Rapid Bolt Cutter, list $175. Our price $75.
1 Nat. Large Pedestal Bolt Pointer, list $150. Our price $50.

Above machines are all of improved make of the National Machinery Co., Tiffin, O., and are in good working order. We offer them at above prices, which are about one-half their value.

Address T. L. PAINE, Manager,
P. O. Box 308, Milwaukee, Wis.

FOR SALE.

Two Morgan Traveling Cranes, each ten tons' capacity, span 45 ft. 6 in. In first-class condition.

THE WESTINGHOUSE MACHINE COMPANY

PITTSBURGH, PA.

FOR SALE.

Sheet Iron and Boiler Rolls, Lever Shears, 11 ft. Squaring Shear, 6 ft. Brake, 15 in Drill Press and 125 lb. Air Cushion Hammer. All in excellent condition.

BERTSCH & CO., CAMBRIDGE CITY, IND

FOR SALE.

All or half interest in foundry and machine shops, doing general repair and architectural iron work. Located in a mining, clay working and glass working city of 18,000 inhabitants. Good opening for a first-class mechanic.

Address **P,**

Care Iron Trade Review, Cleveland, O.

ADJOURNED SALE

—OF—

REAL ESTATE.

By virtue of an order of the Court of Common Pleas No. One of Allegheny County, Pennsylvania, at No. 605 September Term, 1896, the undersigned Receivers of Jennings Brothers & Company, Limited, will expose

AT PUBLIC SALE,

ON THE PREMISES, LEECHBURG, ARMSTRONG CO., PA.,

ON TUESDAY,

The 2nd Day of March, 1897,

At 1:30 o'clock P. M.

All of the Real Estate of said Jennings Brothers & Company, Limited, **upon which is erected a Modern Sheet Mill, fully equipped, consisting of 3 Sheet Mills or 4 Tin Mills, and 3 Modern Cold Roll Mills with ample pickle appliances;** also all Gas and Coal rights.

Terms of sale CASH, 10 per cent of purchase money will be required on day of sale and the balance on confirmation of sale and delivery of deed.

The Safe Deposit & Trust Co., of Pgh., and W. D. McKeefrey, Receivers for Jennings Bros. & Co., Limited.

JOHN D. BAILEY, Auctioneer.

BUYERS' DIRECTORY OF IRON AND STEEL TRADES.

Air Compressors—
Rand Drill Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
The Norwalk Iron Works Co., So. Norwalk, Ct.
Clayton Air Compressor Works, New York.

Analytical Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.

Anti-Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, N. Y.
Magnolia Metal Co., New York City, N. Y.

Babbitt Metal—
C. H. Besly & Co., Chicago, Ill.

Belting—
C. H. Besly & Co., Chicago, Ill.

Blacksmith and Carriage Supplies—
C. H. Besly & Co., Chicago, Ill.

Blowers—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston, Mass.

Blast Furnace Supplies—
Atwood & M'Caffrey, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.

Boilers and Boiler Attachments—
Wm. B. Pollock & Co., Youngstown, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Fulton Steam Boiler Wks. & Fdy., Richmond Ind.
The Hazelton Boiler Co., New York.
Clonbrock Steam Boiler Co., Brooklyn, N. Y.
Harrison Safety Boiler Works, Philadelphia.
Lane & Bodley Co., Cincinnati, O.
Almy Water Tube Boiler Co., Providence, R. I.
Westinghouse, Church, Kerr & Co., Pittsburg, Pa.

Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Boiler Fronts and Fittings—
The Lane & Bodley Co., Cincinnati, O.

Boiler Tubes—
S. Fix Sons, Cleveland.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Bolts and Nuts—
Upson Nut Co., Cleveland, O.

Boring and Turning Mills—
H. Bickford, Lakeport, N. H.

Brass Castings—
Nolte Brass Co., Springfield, O.

Brass Work (Special Finished)—
Nolte Brass Co., Springfield, O.

Bridges—
Shiffler Bridge Co., Pittsburg.

Buildings (Steel Frame.)—
Shiffler Bridge Co., Pittsburg.

Carbon Points—
Jeffrey Mfg. Co., Columbus, O.

Castings—
Lorain Foundry Co., Lorain, O.

Castings (Brass)—
Nolte Brass Co., Springfield, O.
Lorain Foundry Co., Lorain, O.

Chain Hoists—
Moore Mfg. Co., Milwaukee, Wis.

Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
Robert W. Hunt & Co., Chicago, Ill.

Chilled and Sand Rolls—
The Lloyd-Booth Co., Youngstown, O.
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.

Coal and Coke—
Forster, Waterbury & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.
W. H. Coffman Coke Co., Bluefield, W. Va.

Corrugated Iron—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Conveyors—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
American Hoist & Derrick Co., St. Paul, Minn.
Marion Steam Shovel Co., Marion, O.
Brown Hoisting & Conveying Machine Co., Cleveland, O.
Edwin Harrington, Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee Wis.

Damper Regulators—
Jas. L. Robertson & Sons, New York.

Dies—
Toledo Machine & Tool Co., Toledo, O.

Double Spindle Lathes—
Dietz, Schumacher & Boye, Cincinnati, O.

Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Drill Presses—
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Dry Kilns—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston.

Dynamos—
Westinghouse Electric & Mfg. Co., Pitts
General Electric Co., Schenectady, N. Y.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Electrical Supplies—
Westinghouse Electric & Mfg. Co, Pitts urg
General Electric Co., Schenectady, N. Y.
Westinghouse, Church, Kerr & Co., Pittsburg, Pa.
Card Electric Co., Mansfield, O.

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Elevating and Conveying Machinery—
Heyl & Patterson, Pittsburg, Pa.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Engineers and Contractors—
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Edward E. Erikson, Pittsburg, Pa.
Westinghouse, Church, Kerr & Co., Pittsburg Pa.
Heyl & Patterson, Pittsburg, Pa.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Engravers and Electrotypers—
Cleveland Electrotype Co., Cleveland, O.

Engines (Gas)—
The Prouty Co., Chicago, Ill.

Engine Packing—
C. H. Besly & Co., Chicago, Ill.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Buffalo Forge Co., Buffalo, N. Y.
Lane & Bodley Co. Cincinnati, O.
Westinghouse, Church, Kerr & Co., Pittsburg, Pa.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.
Buffalo Forge Co. Buffalo, N. Y.

Exhaust Heads—
Jas. L. Robertson & Sons, New York.

Factory Sites—
Chicago Heights Land Association, Chicago.

Fans—
Buffalo Forge Co., Buffalo N. Y.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Jas. L. Robertson & Sons, New York.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Stowe, Fuller & Co., Cleveland, O.
Dover Fire Brick Co., Cleveland.
F. B. Stevens, Detroit, Mich
Stuart Fire Brick Co., Pittsburg, Pa.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flasks—
Brass Founders' Supply Co., Newark, N. J.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati.

Foundries—
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
The Rippel Mfg. Co., Mt. Gilead, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
East Chicago Foundry Co., Chicago.

Foundry Supplies—
Newport Sand Bank Co., Newport, Ky.
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
F. B. Stevens, Detroit, Mich.
Brass Founders' Supply Co., Newark, N. J.
The Ohio Sand Co., Conneaut, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Friction Metal—
Magnolia Metal Co., New York City, N. Y.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.

Gears—
Superior Machine Co., Cleveland, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.
Superior Machine Co., Cleveland, O.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
Kurtz & Buhrer, Foundry Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Hammers—
Beaudry & Co., Boston, Mass.
Wm. H. Wood, Media, Pa.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.

Hydraulic Machinery—
Stilwell-Bierce & Smith Vaile Co., Dayton, O.
Wm. H Wood, Media, Pa.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore, Bar and Pig Iron—
Lake Superior Consolidated Iron Mines, New York City, N. Y.
Oglebay, Norton & Co., Cleveland.
Condit-Fuller Co., Cleveland.
Forster, Waterbury & Co., Chicago, Ill.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.
Cambria Iron Co., Johnstown, Pa.
Clinton Iron & Steel Co., Pittsburg.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake, Bates & Co., Cleveland, O.
Chas. F. Raud. Prest., New York City.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia
Dietz, Schumacher & Boye, Cincinnati, O
L. S. Starrett Co., Athol, Mass.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY,

PITTSBURG, PA.

Manufacturers of Standard Systems for Electric Light and Power Distribution

IN CITIES, FACTORIES, MILLS AND MINES.

THE TESLA POLYPHASE ALTERNATING SYSTEM OF ELECTRICAL TRANSMISSION by which Power Incandescentand Arc Lighting may be Supplied from the SAME CIRCUIT.

THE WESTINGHOUSE ELECTRIC RAILWAY SYSTEM,

WHICH IS THE MOST DURABLE, ECONOMICAL AND EFFICIENT ON THE MARKET.

NEW YORK, 120 Broadway. CHICAGO, New York Life Building. SAN FRANCISCO, Mills Building.
BOSTON, Exchange Building. PHILADELPHIA, Girard Building. SYRACUSE, N. Y., Bastable Building
BUFFALO, No. 8 Erie County Bank Bldg. PITTSBURG, Westinghouse Building. TACOMA, WASH., 102 S. 10th St.
CHARLOTTE, N. C., 35-38 College St. ST. LOUIS, American Central Building.

WESTINGHOUSE ELECTRIC COMPANY, LTD. 32 Victoria St., LONDON, S. W., ENGLAND. 32 Ave. de l'Opera, PARIS, FRANCE.

For Canada, address AHEARN & SOPER, OTTAWA, ONT.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Double Spindle Lathes—
Dietz, Schumacher & Boye, Cincinnati, O.

Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Diamond Machine Co., Providence, R. I.
Dietz, Schumacher & Boye, Cincinnati, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
Dietz, Schumacher & Boye, Cincinnati, O.
Superior Machine Co., Cleveland, O.

Machine Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Atwood & M'Caffrey, Pittsburg, Pa.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
Superior Machine Co., Cleveland, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & &redge Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.
Card Electric Co., Mansfield, O.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Newport Sand Bank Co., Newport, Ky.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.

Oil Extractors—
Jas. L. Robertson & Sons, New York.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Gates Iron Works, Chicago, Ill.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Jas. L. Robertson & Sons, New York.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Phosphor Bronze Castings—
Nolte Brass Co., Springfield, O.
Lorain Foundry Co., Lorain, O.

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Polishing Machines—
Diamond Machine Co., Providence, R. I.

Portable Forges—
Buffalo Forge Co., Buffalo, N. Y.
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Atwood & M'Caffrey, Pittsburg, Pa.
Henry R. Worthington, Brooklyn, N. Y.
Hughes Steam Pump Co., Cleveland, O.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.
Uehling, Steinbart & Co., Ltd., Newark, N. J.

Radial Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Riveting Machinery—
Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Rolling Mill Supplies—
Atwood & M'Caffrey, Pittsburg, Pa.

Roofs—
Shiffler Bridge Co., Pittsburg.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O
Chicago Screw Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Wm. H Wood, Media, Pa.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O
Edwin Harrington Son & Co., Philadelphia.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Hammers—
Beaudry & Co., Boston, Mass.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O
Marion Steam Shovel Co., Marion, O.

Steam Separators—
Jas. L. Robertson & Sons, New York.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
The Sargent Co., Chicago, Ill.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., Pittsburg, Pa.

Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
Enterprise Boiler Co., Youngstown, O.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Tools—
L. S. Starrett Co., Athol, Mass.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.

Tube Welding—
S. Fix Sons, Cleveland.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

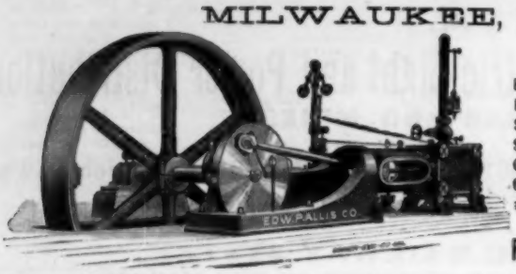
Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
Buffalo Forge Co., Buffalo, N. Y
B. F. Sturtevant Co., Boston Mass.

Wire Machinery—
John Adt & Son, New Haven Conn.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO PITTSBURG.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt & Son, John	27
Ætna-Standard Iron & Steel Co	26
Aitchison, Rob't Perforated Metal Co	31
Allis & Co., Edward P	30
Almy Water Tube Boiler Co	22
Atwood & M'Caffrey	19
Bacon, Earle C	20
Baird Machinery Co	19
Battle Creek Steam Pump Co	22
*Beaudry & Co	—
Besly & Co., C. H	36
Bethlehem Iron Co	35
*Berger Mfg. Co	21
*Bertsch & Co	27
Bickford, H	36
Bourne-Fuller Co	26
Brass Founders Supply Co	32
Brightman Furnace Co	36
*Brown, Edward	—
Brown Hoisting & Conveying Machine Co	35
Bucyrus Steam Shovel & Dredge Co	24
Buffalo Forge Co	1
Cahall Sales Department	1
Cambria Iron Co	26
Card Electric Co	35
Chicago & Northwestern Ry	33
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	35
Cleveland City Forge & Iron Co	1
Cleveland Electrotype Co	35
*Cleveland Galvanizing Works	21
Cleveland Rolling Mill Co	26
Clinton Iron & Steel Co	26
*Clonbrock Steam Boiler Co	21
*C. M. & St. P. Ry	21
Coffman Coke Co., W. H	26
Cole, J. Wendell	36
Deming Co	22
*Diamond Machine Co	—
Dickman & MacKenzie	1
*Dietz, Schumacher & Boye	—
Dixon, Jos. Crucible Co	31
Dover Fire Brick Co	35
Drake, Bates & Co	26
East Chicago Foundry Co	18
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	18
*Fix Sons	21
Fleharty, J. H. & Co	2
Forster, Waterbury & Co	1
*Freeman & Sons, S	21
*Fulton Steam Boiler Wks. & Fdy. Co	21
Gates Iron Works	2
General Electric Co	24
Gerlach, Peter & Co	35
Gobeille Pattern Co	36
Hanna & Co., M. A	26
Harrington & King Perforating Co	34
Harrington, Sou & Co., Edwin	20
Harrison Safety Boiler Works	17
Hartford Steam Boiler Insp. & Ins. Co	35
Hazelton Boiler Co	23
Heyl & Patterson	24
Hooven, Owens & Rentschler Co	24
Hughes Steam Pump Co	23
Hunt & Co., Robert W	2
Illinois Central R. R	27
Illinois Screw Co	1
Iron Clad Paint Co	31
Jeffrey Mfg. Co	23
Jenkins Bros	20
Jessop & Sons, Ltd., Wm	27
Jones Foundry Co., W. A	1
Junction Iron & Steel Co	2
Kellogg Weldless Tube Co	25
Lane & Bodley	32
Lake Superior Consolidated Iron Mines	26
Link-Belt Machinery Co	33
Lloyd Booth Co	34
*Lodge & Shipley Machine Tool Co	36
Lorain Foundry Co	1
Magnolia Metal Co	1
Marine Iron Works	20
Marion Steam Shovel Co	35
Moore Mfg. Co	1
†Newport Sand Bank Co	27
Nolte Brass Co	36
Norman Co., J. J	35
North American Metaline Co	36
Norwalk Iron Works Co	2
Nuttall Co. The R. D	32
Oglebay, Norton & Co	26
†Ohio Sand Co	36
Pickands, Brown & Co	2
Pittman, C. K	2
Pollock, Wm. B. & Co	2
Playford Stoker Co	31
Prouty Co., The	2
Pullman, J. Wesley	26
Q. & C. Co	36
Rand Drill Co	2
Rand, Chas. P., Prest	26
Rippel Mfg. Co	1
Reese, Hammond & Co	36
*Robertson & Sons, Jas. I	—
Rockwell & Co., W. S	33
Sargent Co., The	18
‖Sharon Fire Brick Works	1
Shiffler Bridge Co	22
Southwark Foundry & Machine Co	23
Starrett Co., L. S	1
Sterling Emery Wheel Mfg. Co	34
Stilwell-Bierce & Smith Vaile Co	2
Stevens, F. B	20-36
Stowe, Fuller & Co	18
Stuart Fire Brick Co	33
Sturtevant Co., B. F	2-25
Superior Machine Co	36
Sykes Iron Roofing Co	32
Textor, O	2
Tod, Wm. & Co	34
Toledo Machine & Tool Co	35
Uehling, Steinbart & Co	23
Union Mining Co	18
Upson Nut Co	1
Westinghouse Electric & Mfg. Co	29
Westinghouse, Church, Kerr & Co	23
Westinghouse Machine Co	27
Wood, Wm. H	22
Worthington, Henry R	22
Wellman Seaver Engineering Co	36

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@ 4.75
No. 1 Bessemer hematite	4.00@ 4.25
Hematites No. 1 non-Bessemer	2.25@ 2.50
No 1. Specular, non-Bessemer	2.75@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$ ... 10 90
No. 1 Strong Foundry	11 25@ 11 50
No. 2 Strong Foundry	10 50@ 11 00
No. 1 Gray Forge, red short	... ... 9 50
No. 2 Gray Forge, neutral	... ... 9 75
No. 1 American Scotch	... ... 11 40
No. 2 American Scotch	... ... 10 90
Lake Superior Charcoal	... ... 13 50

PITTSBURG:

No. 1 Foundry	$11 25@ 11 50
No. 2 Foundry	10 50@ 10 75
Gray Forge	... ... 9 50
White and Mottled	... ... 9 25
Warm Blast Charcoal	15 00@ 16 00
Cold Blast Charcoal	... ... 20 00
Bessemer	10 80@ 10 90

CHICAGO:

Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	11 50@ 12 00
Local Coke Foundry No. 2	11 00@ 11 50
Local Coke Foundry No. 3	10 75@ 11 00
Local Scotch Foundry No. 1	11 50@ 12 00
Local Scotch Foundry No. 2	11 00@ 11 50
Local Scotch Foundry No. 3	10 75@ 11 00
Southern Coke No. 1	11 15@ 11 40
Southern Coke No. 2	10 65@ 11 15
Southern Coke No. 3	10 40@ 10 65
Southern No. 1 Soft	10 90@ 11 40
Southern No. 2 Soft	10 65@ 10 90
Southern Silveries	11 40@ 11 65
Jackson Co. Silveries	14 00@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	14 00@ 14 25
Alabama Car Wheel	16 00@ 16 50
Malleable Bessemer	12 00@ 12 25
Coke Bessemer	13 00@ 13 50

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$10 50@ 10 75
Southern Coke No. 2 and No. 1 Soft	10 25@ 10 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Pdy	15 00@ 16 00
Tennessee Charcoal No 1	13 00@ 14 00
Jackson County Silvery No 1	13 50@ 14 00
Southern Coke, Gray Forge	... ... 9 25
" " Mottled	... ... 9 25
Standard Alabama Car Wheel	14 75@ 15 50
Tennessee " "	13 50@ 14 50
Lake Superior " "	14 75@ 15 25

BUFFALO:

No. 1 Foundry Strong Coke Iron Lake Superior Ore	$ ... $12 00
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 75@ 12 00
Ohio Strong Softener No. 1	... ... 12 25
Jackson Co. Silvery No. 1	... ... 14 25
Lake Superior Charcoal	... ... 14 00
Southern Soft No. 1	... ... 12 00
Hanging Rock Charcoal	... ... 17 00

ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$ ... $11 00
Southern Coke No. 2	... ... 10 50
Southern Coke No. 3	... ... 10 00
Southern Gray Forge	... ... 9 75
Southern Charcoal No. 1	... ... 15 00
Missouri Charcoal No. 1	14 00@ 14 00
Ohio Softeners	... ... 15 50
Lake Superior Car Wheel	... ... 15 20
Southern Car Wheel	... ... 15 25

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.] GROSS TONS

Old iron rails	$14 50
Old steel rails	10 50
Old car wheels	10 00

NET TONS

No. 1 R. R. wrought scrap	$10 50
Mill scrap	8 00
No. 1 Machine cast scrap	8 50
Iron axles	14 50
Axle turnings	7 50
Wrought turnings (free from cast)	6 75
Cast borings	5 00
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 00
Pipes and flues (clean)	8 00
Tank iron	8 00
Hoop and band iron	6 00
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	9 00

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland	1.15c
Angles	1.25c
Tees	1.35c
Universal Plates	1.25@1.30c
Sheared Plates	1.30c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.20 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3½ to 4	.80 "
4½ to 4½	1.00 "
4½ to 5	1.30 "
5½ to 6	1.80 "
6½ to 6½	2.30 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

DIXON'S GRAPHITE PAINT

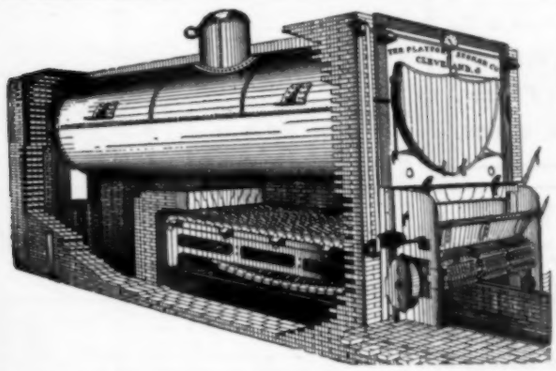
FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL. Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.



The Playford Mechanical Stoker

Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.,

No. 61 Case Library Bldg.,

CLEVELAND, O.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6½ to 7¾	2.50 extra.
¾ to ⅞	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.20 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.63 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.63 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅛ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ¼	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1⅜ to 4 x No. 9 to 3-16	.40 "
1⅜ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes. 1 c extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base.
		Extras.
1½ to 6,	" 10, 11, 12 or 1/4"	.05 per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or 1/4"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 1/4"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or 1/4"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or 1/4"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or 1/4"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or 1/4"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or 1/4"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1⅜,	" 22	.25 "
1 ⅜ to 1⅜,	" 13, 14 and 15	.05 "
1⅜ to 1⅜	" 16, 17 and 18	.10 "

R. D. NUTTALL CO.,

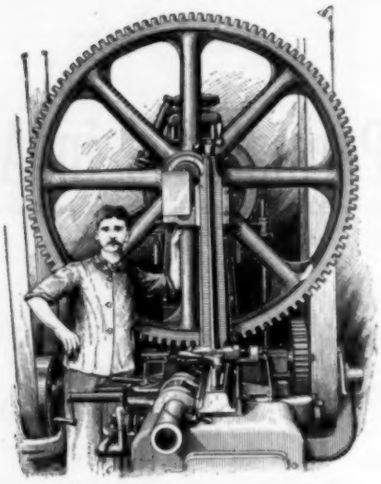
99 BOQUET STREET, ALLEGHENY, PA.

All Kinds of

GEAR CUTTING

AND

Fine Machine Work



Is Right in Our Line. Try Us

THE BRASS FOUNDERS' SUPPLY CO.

FURNACES, FLASKS, FOUNDRY Supplies and Specialties.

Send for our Catalogue and look at the Ribbed Flask.

R. M. BARNETT. 20-34 Prospect St., **NEWARK, N. J.** J. S. MUNDY.

WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., • Chicago and Niles, O.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.

Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1¼ to 1⅜,	"	19 and 20	.15 per 100 lbs
1⅜ to 1½,	"	21	.20 "
1⅜ to 1½,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15 16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
⅜,	"	13, 14 and 15	1.00 "
⅜,	"	16, 17 and 18	1.10 "
⅜,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2 10
No. 25-26	2 20
No. 27	2 30

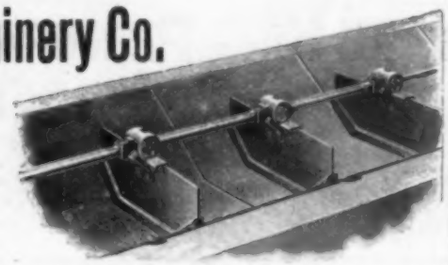
English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.



Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing, Friction Clutches, etc.

IMPROVED DUPLEX SYSTEM

- - - FOR - - -

BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

THE 1896 EDITION

OF THE

Iron and Steel Directory

Will be sent postpaid by *The Iron Trade Review* at **$6.**

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	⅛c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Plate.	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts lbs.
1 to 2 in. inclusive	.08
9-16 to ⅝ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in.	.09
⅜ to 4 in	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in.	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 c0
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black base, four 10s	.62
Butt " " " four 10s	.62½
Lap " galv. " four 10s	.52½
Butt " " " four 10s	.50
Boiler tubes 2¼" and smaller	.70
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 60
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1¼"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	No. 54 to Flour 150 gr.	C. F. F.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5½c	2¾c
¼ kegs ₩ lb	5 c	5¾c	3 c
10 lb cans, 10 in case	6 c	6¾c	3 c
10 lb cans less than 10	10 c	10 c	7½c

Perforated Filter Press Plates.

THE HARRINGTON & KING PERFORATING CO. CHICAGO.

BRONZE SCREEN PLATES To withstand action of ACIDULATED WATERS.

PERFORATORS OF STEEL, IRON, COPPER, ZINC, BRASS AND TIN.

For use in: GRAIN CLEANING AND MINING MACHINERY, WOOLEN, COTTON, PAPER AND PULP MILLS, RICE, FLOUR AND COTTON SEED OIL MILLS, SUGAR AND MALT HOUSES, DISTILLERIES, FILTER PRESSES, STONE, COAL, AND ORE SCREENS, BRICK AND TILE WORKS, FILTERS, SPARK ARRESTERS, GAS AND WATER WORKS, OIL, GAS AND VAPOR STOVES, COFFEE MACHINERY, ETC.

STANDARD SIZES PERFORATED TIN AND BRASS ALWAYS IN STOCK.

Main Office and Works, 226 North Union Street, Chicago, Ill., U. S. A. Eastern Office, No. 284 Pearl St., New York.

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Grant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " " over 5 lbs.....8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¾	3⅛
Hexagon	15⅝	11⅛	8½	6	5¾	5¾	
Washers	9	8	7	5	4½	4½	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.
{ Car lots.....$1.10
{ Less than car lots...$1.60

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

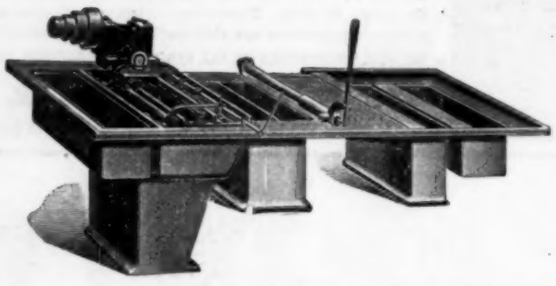
Wire.

New List, Apr. 9, 1894

Brass.....dis 35
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75&5
" " Nos. 27@36.....dis 75&10&5
Coppered Nos. 0 to 18, market list.....dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

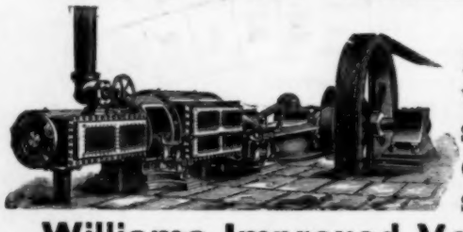
THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY.



Rolling Mills, Sand and Chill ROLLS.

WILLIAM TOD & CO.
YOUNGSTOWN, OHIO.
The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines
For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y. E. F. WILLIAMS.
Park Building, Pittsburg, SEWARD S. BABBITT.

STERLING EMERY WHEEL MFG. CO.
TIFFIN, O.

CORRESPONDENCE SOLICITED

AGENTS:
Chicago Branch, 59 So. Canal St.
The Geo. Worthington Co., Cleveland.
Somers, Fitler & Clarke, Pittsburg

BELT DRIVEN DIRECT DRIVEN

DYNAMOS AND MOTORS

SLOW SPEED HIGH GRADE

THE CARD ELECTRIC CO

MANSFIELD, OHIO. U.S.A.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

J. M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.

HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 Wilshire Bldg., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 Wilshire Bldg., Cleveland, O.

J. E. WOLCOTT, Special Agent, 96 4th Avenue, Pittsburgh, Pa.

CLEVELAND ELECTROTYPE CO.

ELECTROTYPING ENGRAVING AND STEREOTYPING.

50 HIGH ST. — TEL. 2139.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.

Factories on Columbus, Winter and Leonard Sts.

Cleveland, Ohio, U. S. A.

THE BETHLEHEM IRON CO.,

Principal Office and Works,

SOUTH BETHLEHEM, PA.

STEEL RAILS.

BILLETS AND MUCK BAR,

STEEL FORGINGS.

HOLLOW SHAFTING, CRANKS, ROLLS, GUNS AND ARMOR.

Rough, Machined or Finished, Fluid Compressed, Hydraulic Forged.

NEW YORK OFFICE, 100 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.

CHICAGO OFFICE, MARQUETTE BUILDING.

No. 34 Power Press

TOLEDO MACHINE & TOOL CO.,

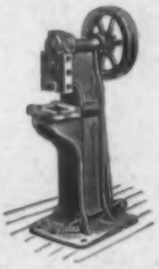
501-505 Superior St., Toledo Ohio.

We manufacture

Power Punches. Forging Presses.
Power Presses. Trimming Presses.
Straight Sided Double Pitman Presses.
Drop Presses.
Embossing Presses. Automatic Feed Presses.
Stamping Presses. Power Slitting Machines.
Riveting Machines. Power Shears.

Special and Automatic Machinery Dies for all classes of work in sheet metals.

Write for catalogue and prices.



No. 31 Power Press.

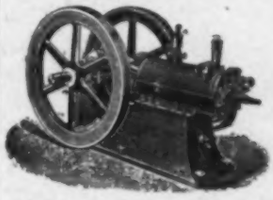
THE "CLEARFIELD" FIRE BRICK

MANUFACTURED BY

THE CLEARFIELD FIRE BRICK CO., Limited,

Office and Works at CLEARFIELD, PA.

929 Liberty Street, Pittsburg, Pa., John Richardson, Agent.



THE CHICAGO GAS and GASOLINE ENGINE

The simplest gas and gasoline engine on the market. Has no equal for absolute, steady speed and durability. It is a dwarf in size and a Samson in strength.

Catalogue sent on application.

MANUFACTURED BY

J. J. NORMAN CO., 60 S. Clinton St., Chicago, Ill.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year $3.00.

THE BROWN HOISTING AND CONVEYING MACHINE CO. CLEVELAND, O.

MACHINERY FOR HANDLING COAL AND ORE.

CRANES

NEW YORK, HAVEMEYER BLDG. PITTSBURG, CARNEGIE BLDG. CHICAGO, MARQUETTE BLDG.

KING'S SIX TON ELECTRIC CRANE

Can be furnished at low cost.

Write for full information to the MARION STEAM SHOVEL CO Marion, Ohio.

FIRE DOVER FIRE BRICK CO., BRICK

MANUFACTURERS OF

Furnace, Mill and Special Shape Fire Brick.

Office, 44 Mercantile Bank Bldg., CLEVELAND, OHIO.

THE

ELLMAN,

SEAVER

IGINEERING CO.,

w England Bldg.,

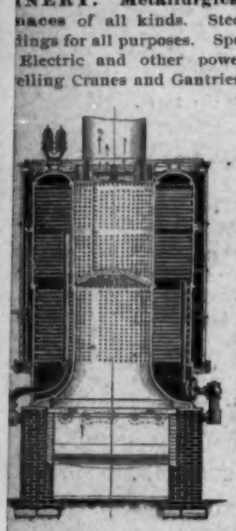
LEVELAND, O.

ENGINEERS

AND

ONTRACTORS.

make a specialty of the de- and construction of STEEL RKS, ROLLING MILLS STEEL WORKING MA- INERY. Metallurgical naces of all kinds. Steel ings for all purposes. Spe- Electric and other power elling Cranes and Gantries



have undertaken to exploit Berry Safety Boiler.

WHY?

cause after watching it in the lest kind of service for two s, we are fully convinced that mbodies in its construction e good points than any other er ever built.

will be manufactured at the ks of John Mohr & Sons, cago, which fact alone is a rantee that both material and kmanship will be the best money can buy.

me of the good points of the y Boiler are the following:

t gives uniformly DRY STEAM.

is SAFE and durable.

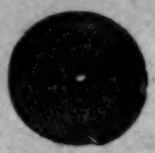
economical in first cost.

is economical in maintenance.

ives the greatest horse- wer per square foot of floor space occupied.

nd for our descriptive pam- t, which will tell you the le story.

THE HART OR DETROIT



Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,

District Manager, No. 911 Chicago Opera House Block, Chicago, Ill., or Box 84, Columbus, O.

N. B.—Also Agent of Wm. Sellers & Co.'s Special Tool Grinder and Twist Drill Grinder with Pointer, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

AUTOMATIC GEAR CUTTERS

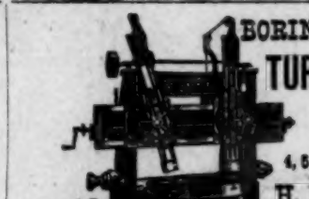
GEAR CUTTING OF ALL KINDS.

SUPERIOR MACHINE CO., CLEVELAND, O.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.



BORING AND TURNING MILLS,

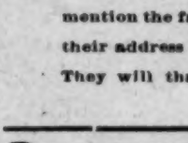
4, 5 & 6 Ft. Swing

H. Bickford

Lakeport, N. H

Send for Photograph and Low Price.

OILLESS BEARINGS



For Loose Pulleys and other bearings. Perfectly clean. No cutting or danger of fire from overheating. Send for Loose Pulley circular.

No. American Metaline Co. 40 to 48 Third Street, Long Island City, N. Y.

F. B. Stevens

90 Griswold St., Detroit, Mich.

Fire Brick, Fire Clay and Foundry Supplies.

Established 1879.

THE OHIO SAND COMPANY

SHIPPERS OF ALL GRADES OF

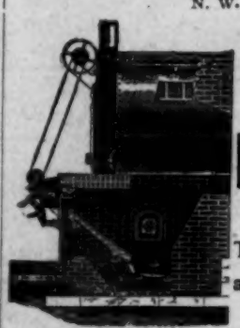
MOULDING SAND.

Our Sand is SECOND TO NONE. Banks at Conneaut and Kingsville. Samples and Prices on Application.

Conneaut, Ohio.

The Iron Trade Review is an increasingly valuable medium through which to sell equipment to machine shop and foundries.

N. W. Taylor. H. H. Campbell.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

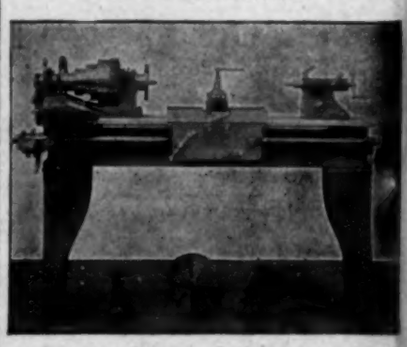
THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

ENGINE LATHES.

14" to 42" SWING.



THE LODGE & SHIPLEY M. T. CO.

Culvert & Harrison Streets,

CINCINNATI, O.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

BRASS CASTINGS for all purposes. PHOSPHOR BRONZE for Machine Box Bearings, etc. Special Finished Brass Work made to order.

NOLTE BRASS COMPANY,

65 and 67 E. Washington St., Springfield, Ohio.

"HAMMOND" AND "ACME"

HIGH GRADE FIRE BRICK

ARE THE BEST.

MANUFACTURED BY

Reese, Hammond & Co.,

BOLIVAR, PA.

Specialties: Tile, Grate Settings, Stove Linings and Difficult Shapes to order, Cupola Blocks.

BEST ANTI-FRICTION METAL